Issued with January Number, 1898.

Proceedings.

NAMES PROPOSED FOR MEMBERSHIP.

Knerr, Prof. E. B., Atchison, Kansas.
Craighill, Geo. P., Lynchburg, Va.
Kessler, J. J., Jr., Paris, Ontario.
Fernandez-Cavada, F., Audubon Expt. Sta., New Orleans, La.
Deck, Rev. James, Georgetown Univ., Georgetown, D. C.
Griffin, John J., Ph.D., Catholic University of America, Washington, D. C.
Gomberg, M., Univ. of Mich., Ann Arbor, Mich.
Mahon, R. W., McKeesport, Pa.
Small, Fritz H., Smethport, McKean Co., Pa.
Lyons, Robert E., Ph.D., Bloomington, Ind.
Reddell, Dell F., 1248 N. 27th St., Lincoln, Nebr.
James, Joseph H., 1969 Amsterdam Ave., N. Y. City.
Engle, Wilber D., 513 W. 145th St., N. Y. City.
Betts, Anson G., Lansingburgh, N. Y.
Gotthelf, August H., Hastings-on-Hudson, N. Y.
Watters, Leon L., 153 E. 56th St., N. Y. City.
Miller, Alfred S., Moscow, Idaho.
Elliott, Arthur H., 4 Irving Pl., N. Y. City.
Harris, C. D., N. C Agr. Expt. Sta., Raleigh, N. C.
Remsen, Prof. Ira, Johns Hopkins Univ., Baltimore, Md.
Jessurun, David, Lawrence, La.
Georgii, Max, 606 F St., Washington, D. C.
Jacobs, Chas. B., Ampère, N. J.
Roberts, Chas C., West Chester, Pa.
Elworthy, Herbert S., care H. S. King & Co., 65 Cornhill, London, E. C.
Chalon, P. F., 86 Rue Cardinet 86, Paris, France.
Kastle, Dr. J. H., Agr. Coll., Lexington, Ky.

NEW MEMBERS ELECTED DECEMBER 11, 1897.

Bucher, Dr. John E., R. I. Coll. A. and M. Arts, Kingston, R. I.
Calvert, Sidney, Columbia, Mo.
Coblentz, Virgil, Ph.D., Coll of Pharmacy, 118 W. 68th St., N. Y.
Dales, Benton, Box 14, Lincoln, Nebr.
Davoll, David L., 2421 Dearborn St., Chicago, Ill.

Getman, Frederick Hutton, 196 Atlantic St., Stamford, Conn.
Haynes, D. O., 106 Fulton St., N. Y. City.
Hopkins, Erastus, 205 State St., Boston, Mass.
Howe, Elmer P., Exchange Building, 53 State St., Boston, Mass.
Knox, James W. T., care of F. Stearns & Co., Detroit, Mich.
Kunze, William F., Univ. of Minn., Minneapolis, Minn.
Langmuir, Arthur C., care of Ricketts & Banks, 104 John St., N. Y.
Larchar, Arthur B., Wareham, Mass.
Parmelee, H. C., 804 N. 8th St., Beatrice, Nebr.
Rodgers, S. M., 27th and Smallman Sts., Pittsburg, Pa.
Sawyer, Harry B., Central High School, St. Paul, Minn.
Suter, Frank, Eastern High School, Washington, D. C.
Wagner, Chas. L., care of The Wm. S. Merrell Chem. Co., Cincinnati, O.
Watson, Edward Thompson, Ohio State Univ., Columbus, O.
Weston, David B., Watertown, Mass.

ASSOCIATES ELECTED DECEMBER 11, 1897.

Annison, Frederick George, Undercliffe, Hohokus, N. J.
Finley, Norval Howard, 6638 Deary St., Pittsburg, Pa., Station A.
Parsons, Schuyler L., Parsons & Petit, 136 Pearl St., N. Y.
Steenken, J. G., Battelle & Renwick, 163 Front St., N. Y.

CHANGES OF ADDRESS.

Asbury, S. E., Chambers, Burke Co., N. C.
Cameron, Frank K., Cornell Univ., Ithaca, N. Y.
Hart, Charles, care Sharon Iron Co., Sharon, Pa.
Hopkins, Cyril G., 103 E. State St., Ithaca, N. Y.
Jone, Hugo, 3544 Wabash Ave., Chicago, Ill.
Jones, L. J. W., Omaha Club, Omaha, Nebr.
McDonnell, H. B., College Park, Md.
Wood, Joseph R., Haverford, Pa.

MEETINGS OF THE SECTIONS.

WASHINGTON SECTION.

The ninety-seventh regular meeting of the Chemical Society of Washington was held in Cosmos Club Hall, Washington, D. C., November 11, 1897. The Society was called to order at 8.05 P. M., by the President, Dr. Bigelow, with thirty members present.

The first paper of the evening, read by Dr. H. Carrington Bolton, was entitled "Hysterical Chemistry," a term which he applied to the preposterous theories and claims of a certain small group of writers on chemistry who call themselves Monists. They advocate unity of matter, and reject identity, replacing the latter by analogies. He gave examples of their method of reasoning, one instance being the following:

"An atom is a hypothesis. A hypothesis has no weight. Therefore atomic weight is a nonentity."

The speaker showed that these writers did little or no experimental work, yet claimed to be revolutionizing chemistry by their publications: also that they deserve no serious consideration. The paper was discussed by Dr. Seaman and Dr. Wiley, who showed that such ideas were prevalent to a small extent in both Great Britain and the United States.

Mr. Wirt Tassin's paper, entitled "The Preparation of Crystals," consisted of a review of the several methods of preparing crystals for the determination of their geometrical and physical constants, the methods being grouped under the following heads:

A. Solution, treating of the preparation of crystals of a substance from its solution in a liquid by evaporating and cooling the solution; by the reaction of soluble compounds; or by chemical changes in general. The general rules to be observed being:

1. The crystallization must proceed as slowly as possible.
2. The solution must be of the least viscosity possible.
3. The crystallizing substance must be present in the solution in the greatest quantity.
4. The crystals desired for measurement must be removed from the solution, preferably when it is at its minimum temperature, and must be quickly and completely dried in order to prevent corrosion or etch figures forming.

B. Sublimation, in which case the crystals may be obtained direct, or a non-volatile compound may be obtained as a result of chemical action between two or more volatile substances, or from a volatile substance and a gas.

C. Fusion, where the crystals are secured by slowly cooling

a homogeneous magma ; or by a solution of the substance in a molten magma. The crystals are formed either with or without pressure.

The last paper of the evening was read by Dr. E. A. de Schweinitz, and was entitled "A Convenient Dropping Bottle." This bottle was devised especially to be used by ophthalmologists for the purpose of keeping collyria sterile and free from dust, and at the same time a bottle which was very easy to handle, and from which the solution could be dropped into the eye with almost any desired rapidity. It is a small pear-shaped flask with a long neck at a right angle to the bottle. The end of the tube is drawn out to a moderately fine point and provided with three bends, so that the end dips downward. The object of these bends is to prevent the dust from entering the bottle. At the same time when they are filled with liquid the rest of the solution is sealed. On the side of the flask opposite the neck is a short open arm, to which a small rubber dropping bulb can be attached to regulate the rapidity with which this liquid is allowed to flow out at the bottom. A little cotton should be placed in this arm to keep out the dust. The dropper is adopted for general microchemical and volumetric work.

Prof. Charles E. Munroe made an exhibit of paraformaldehyde and the lamps used in generating formaldehyde from it. This substance is sold in the form of tablets and makes a convenient laboratory source of formaldehyde. The gas is very readily given off from the tablets at comparatively low temperatures.

Mr. V. K. Chesnut exhibited specimens of Amanita muscaria, the fungus which caused the recent death, in Washington, of Count de Vecchj, and the serious poisoning of Dr. Daniel J. Kelly. Colored plates were shown which showed how the fungus was mistaken for that of the closely related, but edible, species, Amanita caesarea. Brief remarks were also made about the poisonous constituents characteristic of the two most poisonous Amanitas and their characteristic action on the human system.

The society adjourned at 10.15 P. M.

V. K. CHESNUT, *Secretary.*

RHODE ISLAND SECTION.

A monthly meeting of the Rhode Island Section of the Ameri-

can Chemical Society was held at the Hope Club, Providence, October 28, 1897, with Mr. Edward D. Pearce as presiding officer.

After dinner Prof. J. H. Appleton, of Brown University, presented a paper on "Some Recent Developments in Chemistry." The speaker discussed the liquefaction of fluorine, Moissan's artificial diamonds, and Dr. Emmens' argentaurum

The December meeting of the Rhode Island Section was held at the Hope Club, Providence, December 16, 1897, with Mr. Edward D. Pearce as presiding officer.

After dinner Mr. John C. Hebden presented a paper on "Indigo and the Syntheses of Indigo." The author discussed the preparation of indigo from the products of fermentation of certain plants, together with some of the results obtained by the decomposition of indigo. Starting from several different compounds, it was also demonstrated how indigotin could be produced synthetically.

WALTER E. SMITH, *Secretary.*

NEW YORK SECTION.

The regular meeting of the New York Section was held at the College of the City of New York, on Friday evening, December 10, Dr. Wm. McMurtrie presiding, with seventy-one members and visitors present.

The following papers were read: Marston T. Bogert, "Necrological Notice of Dr. Charles E. Colby;" G. E. Barton, "A Proposed New Form of Crucible Cover;" L. Reuter, "Notes on the Purity and Reactions of Some Chemicals;" Durand Woodman, "The Technical Analysis of Coal;" Robert W. Cornelison, "A Brief Review of the Definite Chemical Substances used in Perfuming—with Exhibits of Products."

Mr. Cornelison gave a list of the various substances used in perfuming, with trade names, chemical composition, a brief outline of the method of preparation, present prices, etc.

The chair called attention to the value of reviews of progress in all lines of chemical work, and urged the members to contribute such work for the meetings.

On motion, the meeting was adjourned to January 7, 1898.

The regular meetings of the New York Section will be held in the Chemical Lecture Room of the College of the City of New York, 17 Lexington Avenue (at the corner of Twenty-third Street), on Friday following the first Monday of each month, at 8.15 P. M., and all chemists who are in the city, whether members of the Society or not, are cordially invited to attend them and take part in the proceedings.

DURAND WOODMAN, *Secretary.*

CINCINNATI SECTION.

The December meeting of the Cincinnati Section took place in the Lloyd Library on December 15, Prof. O. W. Martin in the chair, and fourteen members present. Among the guests present was Gen. J. Warren Kiefer, of Springfield, O.

Mr. J. W. Ritchey, 701 Baymiller St., Cincinnati, was elected a member of the Section. A paper by Prof. Jas. Lewis Howe and Mr. H. D. Campbell, entitled "On Some New Ruthenocyanides and the Double Ferrocyanide of Barium and Potassium," was read by the secretary on account of the absence of the authors. Prof. J. U. Lloyd then gave a biography of Peter Smith, "The Indian Doctor," and an outline of the contents of his exceedingly rare dispensatory, the first publication on American materia medica west of the Alleghenies. The demonstration of perhaps the only copy now in existence, in possession of Gen. Kiefer, a grandson of Dr. Smith, added to the interest of the paper. Lastly, Dr. R. Monroe McKenzie spoke on the mode of preparation and the properties of liquid fluorine, as demonstrated by Moissan and Dewar at the Toronto meeting of the British Association for the Advancement of Science.

After the reading of the reports of the Secretary and the Treasurer, the following officers were elected for the year 1898:

President, O. W. Martin.

Vice-Presidents, Wm. Simonson and S. P. Kramer.

Secretary, S. Waldbott.

Treasurer, Henry B. Foote.

Directors, Fred. Homburg, H. E. Newman, and Hannah L. Wessling.

On motion the meeting adjourned.

S. WALDBOTT, *Secretary.*

Issued with February Number, 1898.

Proceedings.

The canvassers appointed for that purpose having reported that 275 votes had been cast in favor of and 23 against the adoption of the new constitution submitted to the members on October 26, 1897, it was declared adopted by the President, December 2, 1897.

SIXTEENTH GENERAL MEETING OF THE AMERICAN CHEMICAL SOCIETY.

The American Chemical Society convened for its Sixteenth General Meeting in the lecture hall of Columbian University, corner of 15th and H Streets, Washington, D. C., at 10 A.M., Wednesday, December 29, 1897. The sessions of the society were held upon this and the following day.

The opening session wss called to order by President Dudley, who then introduced President B. L. Whitman, of Columbian University. The latter extended a cordial welcome to the visiting chemists, and President Dudley responded on behalf of the Society.

The minutes of the Fifteenth General Meeting held in Detroit, Mich., August 9 and 10, were approved in the form in which they had already appeared in the Journal of the society.

Papers were then presented and discussed in the following order:

1. A New Test for Yellow Azo Dye in Fats, Butter, etc." By Joseph F. Geisler. Discussed by Messrs. C. B. Dudley, Crampton and de Schweinitz.

2. "Some New Ruthenocyanides and the Double Ferrocyanide of Barium and Potassium." By James Lewis Howe and H. D. Campbell.

3. "The Atomic Weight of Zirconium." By F. P. Venable. Discussed by Messrs. Clarke, E. F. Smith, Venable, Hillebrand, W. L. Dudley, Elworthy, Baskerville, and Cushman.

4. "The Determination of Sulphur in Gas Mixtures." By F. C. Phillips.

5. "Derivatives of Silicon Tetrachloride." By J. F. X. Harold.

After a few announcements the morning session was adjourned.

Early in the afternoon, through the courtesy of the Local Committee of Arrangements, various places of interest were visited by the chemists. The public buildings were kept open two hours longer than usual, and the members were admitted to view processes from which the public are excluded. At 4 P. M. they were served a bountiful luncheon by Mr. Christian Heurich, at his brewery, foot of 22nd street, N. W.

WEDNESDAY EVENING, DECEMBER 29, 1897.

The evening session was called to order by President Dudley at half-past seven o'clock.

The annual reports of the secretary, the treasurer, and the librarian were read and ordered placed on file. The librarian called attention to the fact that in some instances only a few of the back numbers of the Journal were left on hand, and suggested that such back numbers be reprinted. Upon motion of Mr. McKenna the question was referred to the council.

In the absence of the editor, the secretary read a brief communication from him, and a motion was passed, giving to the editor the option of making a formal report later, to be sent to the secretary and placed on file.

The secretary then read a brief report from Dr. Hart as Chairman of the Committee on Spelling and Nomenclature in the Journal. Reports were called for from the Committees on Duty-Free Importations, on Coal Analysis, and on Standard Color for Water Analysis. Only brief oral reports were presented, as nothing of importance had been done since the last general meeting.

Prof. Clarke made some remarks on his annual report on atomic weights, the report itself being reserved for publication in the Journal.

The results of the ballots for officers for the year 1898, as presented by the report of the canvassers, were announced by the president as follows:

President—Charles E. Munroe.

Secretary—Albert C. Hale.

Treasurer—Charles F. McKenna.

Librarian—F. E. Dodge.

Directors—Albert B. Prescott, Charles F. Chandler, Peter T. Austen, Charles B. Dudley.

Councilors—F. W. Clarke, A. A. Noyes, G. F. Barker, W. L. Dudley.

After some announcements by Dr. Bolton, Chairman of the Entertainment Committee, Vice-President Bigelow, Chairman of the Washington Section, was called to the chair, and President Dudley read his annual address. The evening session was then adjourned.

THURSDAY MORNING, DECEMBER 30, 1897.

The society was called to order by President Dudley at 10.30 A.M.

Papers were presented and discussed in the following order:

6. "The Respiration Calorimeter." By W. O. Atwater. Read by C. F. Langworthy.

7. "Glucose in Butter." By C. A. Crampton. Discussed by Messrs. Patrick, Elworthy, and Crampton.

W. P. Mason related some incidents in connection with a case of poisoning by carbon monoxide, and afterward presented his paper on—

8. "Some Thoughts Concerning the Teaching of Chemistry." This was discussed by Messrs. Hale, Howe, Seaman, C. B. Dudley, and Pellew.

After some announcements by the Local Committee, L. P. Kinnicutt presented a paper on—

9. "Recent Developments in the New Methods of Sewage Purification." Discussed by Messrs. Mason and Phillips.

Then followed other announcements by the Local Committee and a paper on—

10. "Contributions from the Laboratory of Cornell University." By Frank K. Cameron.

Mr. E. E. Ewell moved that a committee of five be appointed by the president to study and report upon the means by which the society can hasten the adoption of uniform systems of

graduation, definite limits of accuracy, and standard methods for using all forms of measuring instruments in use in chemical laboratories. Further, that the committee be instructed to cooperate with other scientific bodies which have already undertaken this work, or which may enter upon it in the future. By vote of the society, this motion was referred to the council.

H. W. Wiley made a statement in reference to the Third International Congress of Applied Chemistry, at Vienna, in 1898.

Some announcements were made by the secretary, and a communication was read by him from the secretary of the Nebraska Section of the society, enclosing invitations from the Governor of Nebraska, the officers of the University of Nebraska, and the Nebraska Section of the American Chemical Society, for the society to hold its summer meeting in Lincoln, Nebraska. These invitations were referred to the council.

Upon motion of A. H. Sabin, the thanks of the society were extended to the following named persons and corporations for their many courtesies to the society in connection with its Sixteenth General Meeting:

The corporation of Columbian University and President B. L. Whitman; the board of management of the Cosmos Club; Col. Sumner, commanding Fort Meyer; Mr. Christian Heurich; Dr. G. E. Abbot, president of Washington, Alexandria, and Mt. Vernon Railway; Col. Claude M. Johnson, director of Bureau of Engraving and Printing; Corcoran Gallery of Art; Hon. F. W. Palmer, public printer; Prof. Henry S. Pritchard, superintendent of Coast and Geodetic Survey and director of Weights and Measures; Commander E. C. Pendleton, superintendent of Naval Gun Factory; U. S. Naval Museum of Hygiene; officers and members of the Local Committee of Arrangements; daily press; and members of the Washington Section of the American Chemical Society.

THURSDAY AFTERNOON AND EVENING, DECEMBER 30, 1897.

President McKinley received the visiting chemists and their friends at the White House at 2.30 P. M. The rest of the afternoon was spent in visiting various government buildings in the city.

In the evening a sumptuous banquet was given by the visit-

ing chemists at the Maison Rauscher, corner Connecticut Ave. and I street.

FRIDAY, DECEMBER 31, 1897.

Although the meeting had been formally closed on the previous day, the hospitalities of the Washington Section and Local Committee of Arrangements had prepared a very interesting program for Friday, which was enjoyed by a great many of the visiting chemists. In the morning there was an excursion and visit to Mount Vernon on a special car furnished through the courtesy of Dr. Abbot. Returning from Mount Vernon to Arlington at 1.30 P.M., the chemists watched the Cossack drill at Fort Meyer, which had been specially arranged for that day by the War Department, in order to accomodate the visiting chemists. ALBERT C. HALE, *General Secretary.*

ANNUAL REPORT OF THE GENERAL SECRETARY OF THE AMERICAN CHEMICAL SOCIETY.

To the Members of the American Chemical Society:

The past year has been one of unusual activity and has marked a special era in the progress of the American Chemical Society. Many plans and ideas which have been proposed for the development of the society, the promotion of the interests of its members, and the advancement of chemical science during the past few years, have been matured and put into definite and practical shape during the year 1897. New plans have also been suggested and adopted, and it is believed that the society is now in better working condition than ever before. The Committee on the Revision of the Constitution has completed its labors, and the proposed constitution has been adopted. The same committee has been appointed to revise the by-laws, and that work is now in progress. A new contract for the printing of the Journal, and one better adapted to the present needs of the society, has recently been signed, and arrangements have been made for the publication of the "Review of American Chemical Research" in the current issues of the Journal. A committee has recently been appointed to take into consideration the whole question of providing abstracts for the Journal with the view of further increasing its usefulness. A new committee on advertising has been

appointed with the hope of increasing greatly the revenue of the society from that source. Some matters of minor importance have been put into operation, or are under consideration at present for increasing the efficiency of the society in various directions.

The Summer meeting of the society was held in Detroit, Michigan, August 9th and 10th, in connection with the meeting of Section C of the American Association for the Advancement of Science. The plan adopted the year before for bringing the Summer meeting of the society into closer relations with that of Section C was there put in operation for the first time, with results that are highly gratifying to all concerned. The papers offered for the two bodies were put together and classified according to subjects, the subjects being distributed to the different sessions throughout the week. On Monday there was a business meeting of Section C for the purposes of organization in the morning, and late in the afternoon the vice-president's address was delivered before the section. With these exceptions the time on Monday and Tuesday was given to the American Chemical Society, and the balance of the week to Section C. There was a large attendance at these meetings, and the interest of the chemists was better sustained than usual throughout the week.

A new local section of the society was established last June, known as the Columbus Section, for the interests of the members residing in Columbus, Ohio, and vicinity. This is the tenth local section that has been established; the other nine being known as follows: Rhode Island, Cincinnati, New York, Washington, D. C., Lehigh Valley, New Orleans, Chicago, Nebraska, and North Carolina Sections.

The membership of the society has steadily increased during the past year, as will be seen from the following comparative statement:

ENROLLMENT DECEMBER 26, 1896.

Members	939
Associates	65
Honorary members	7
Total	1011

ENROLLMENT DECEMBER 26, 1897.

Members	1071
Associates	78
Honorary members	7
Total	1156

To a certain extent this increase in enrollment is due to the fact that members in arrears are not now dropped from the rolls until the expiration of two years, while up to 1897 all in arrears for one year were dropped. This would, however, make but comparatively little difference. There has been a healthy growth of the society in actual membership.

Since the last annual report the society has lost, by death, the following named members and associates:

D. D. Williamson, Associate, January 3, 1897.
T. G. Wormley, January 3, 1897.
T. A. Havemeyer, Life Associate, April 26, 1897.
Carl Schultz, May 29, 1897.
Edgar McClure, July 27, 1897.
M. Alsberg, September 7, 1897.
C. E. Colby, October 15th, 1897.

The following financial statement is for the period of December 25, 1896, to December 20, 1897, inclusive:

RECEIPTS.

Balance in Bank Dec. 24, 1896	$ 98.25
Dues received from Dec. 25, 1896, to Dec. 20, 1897, inclusive	5138.75
Interest on bank deposits	10.70
Total	$5247.70

DISBURSEMENTS.

Paid to treasurer of American Chemical Society as per vouchers	$ 4680.00	
General secretary's commission	513.87	
		$5193.87
Balance on deposit in bank, Dec. 20, 1897	$ 15.58	
Checks on hand, Dec. 20, 1897	$ 38.25	
		53.83
Total		$5247.70

Respectfully submitted,

Albert C. Hale,
General Secretary American Chemical Society.

REPORT OF TREASURER FOR THE YEAR 1897.

NEW YORK, Dec. 22, 1897.

RECEIPTS.

Balance on hand December 26, 1896		$1017.69
Net dues and interest received from the general secretary		4680.00
Cash received for subscriptions to Journal and sales of back numbers		716.84
Cash received for advertisements in Journal		561.89
Interest from Farmers' Loan and Trust Co		17.75
		$6994.17

DISBURSEMENTS.

For publication of Journal		$3226.05
" reprinting back numbers of Journal		405.90
" authors' reprints		119.35
" editor's salary, 1896		250.00
" " " 1897		250.00
" expenses of editor's office		45.58
" " " secretary's office		886.81
" " " librarian's "		139.49
" " " treasurer's "		100.00
" " " Troy meeting		107.89
" " " Detroit "		54.00
" general expenses		12.04
" rebates to local sections as follows:		
New York	$270.00	
Washington	116.67	
Cincinnati	73.33	
Chicago	40.00	
Nebraska	21.66	
Rhode Island	25.00	
North Carolina	28.33	
	$574.99	
Balance with Farmer's Loan and Trust Co., December 22, 1897		822.07
		$6994.17

No bills or claims presented up to date and audited remain unpaid.

CHAS. F. MCKENNA, *Treasurer.*

Accounts examined and found correct E. and O. E.

A. H. SABIN,
DURAND WOODMAN,
A. P. HALLOCK.
Finance Committee.

LIBRARIAN'S REPORT FOR 1897.

There is little to report this year, as the library has been in storage during the year. It is insured and in good condition. There has been about the same sale of back numbers of the Journal as last year. I have seventy-five and $\frac{20}{100}$ ($75.20) dollars, which I have collected during the year, and there is a larger amount due on orders filled.

I would recommend that the price of single numbers of the Journal, to others than members, be raised to fifty cents, as the present price, forty-two cents, leaves no margin on reprinted numbers, and does not even cover postage.

It will soon be necessary to reprint Vol. III of the Journal, as there are only about twenty copies remaining.

F. E. DODGE, *Librarian.*

REPORT OF THE EDITOR FOR 1897.

During the year just past a total of 966 pages of transactions, 66 pages of proceedings, 12 pages of title and contents, and 210 pages of the Review of American Chemical Research, a grand total of 1254 pages, have been printed and distributed to members. The total number of copies of the December issue distributed was 1255. For December, 1896, 1176 copies were sent out.

Experience has shown it to be desirable that not less than 300 copies of each issue should be laid aside to meet probable future demands, and as the edition printed is now 1500 copies, it is evident that this must probably be increased in the near future. A revision of the exchange list is now in progress, and it is hoped this may result in the addition of a number of copies to the available stock.

It is to be hoped that the members will more generally feel the desirability of sending all their chemical papers to the Journal. To read papers at the meetings and then send them elsewhere for publication, as is now sometimes done, can scarcely be considered fair to the society. Each member should feel the obligation to send his best work for publication, since only in this way can the Journal retain the position it now holds and advance to a better.

I wish to thank my associates on the Committee on Papers and Publications, Messrs. J. H. Long and Thomas B. Osborne, for the prompt and careful manner in which they have cooperated with me in the discharge of our responsible, difficult, and often disagreeable duties. EDWARD HART, *Editor.*

COUNCIL.

It was ordered, December 22, 1897, that the dues for membership for 1898 be collected by the general secretary as in the current year, and that he be allowed ten per cent. on all collections as compensation for his work.

NAMES PROPOSED FOR MEMBERSHIP.

Adams, Maxwell, Box 117, Chico, California.
Chamberlain, Geo. E., Glucose Works, Bush and Taylor Sts., Chicago, Ill.
Gere, Miss Mariel C., 849 D St., Lincoln, Nebraska.
Gooch, Prof. F. A., Yale Univ., New Haven, Conn.
Graham, S. L., Rome, Ga.
Guess, Harry A., care of Ottawa Gold Milling and Mining Co., Ltd., Keewatin, Ontario.
Hufham, J. D. Jr., Expt. Sta., Raleigh, N. C.
Langworthy, Dr. C. F., Dept. of Agr., Washington, D. C.
Maharg, W. S., City Hall, Chicago, Ill.
Parker, Francis L., Jr., S. C. Mil. Acad., Charleston, S C.
Stetson, Frank O., 1802 R St., Washington, D. C.
Stevenson, J. Stewart, Box 902, Deadwood, S. D.
Thurnauer, Gustav, Chicago and Aurora Sm. and Ref. Co., Aurora, Ill.
Vreeland, Cornelius D., Chicago Heights, Ill.

NAME PROPOSED FOR ASSOCIATE MEMBERSHIP.

Peppel, Samuel Vernon, Ohio State Univ., Columbus, O.

NEW MEMBERS ELECTED DECEMBER 30, 1897.

Babcock, Stephen C., Ill. Steel Co., South Works, Chicago.
Ely, Charles R. Gallaudet College, Washington, D. C.
Fell, Joseph W., 235 Twelfth St., Washington, D. C.
Harper, Charles A., Ph.D., 2139 Gilbert Ave., Cincinnati, O.
Knerr, Prof. E. B., Atchison, Kans.
Mangam, Dr. Daniel C., 95 Park Ave., Brooklyn, N. Y.
Mitchell, Robert H., 711 Sutter St., San Francisco, Cal.
Passolt, H. A., Ill. Steel Co., North Works, Chicago.
Pendleton, Prof. Hunter, Lexington, Va.
Pond, F. J., State College, Pa.
Portner, Edward G., 1104 Vermont Ave., Washington, D. C.

Richardson, Clifford, care of Barber Asphalt Paving Co., Long Island City, N. Y.
Simons, Frank D., 1749 Madison St., Washington, D. C.
Steel, Frederick W., care of Fiji Sugar Co., Ltd., Tamunua, Narna, Fiji.
Thigpen, John H., Columbian Univ., Washington, D. C.
Whitaker, DeBerniere, Sparrows Point, Md.

ASSOCIATE ELECTED DECEMBER 30, 1897.

Spieler, August J., care of Emery Candle Co., Ivorydale, O.

CHANGES OF ADDRESS.

Boot, J. C., care Mr. A. A. Gobius, Secretarie Buitenzorg, Dutch East Indies.
Evans, W. L., High School, Colorado Springs, Colo.
Hitchcock, Miss F. R. M., 4038 Walnut St., Philadelphia, Pa.
Hopkins, C. G., 103 E. State St., Ithaca, N. Y.
Johnson, O. C., 730 Thayer St., Ann Arbor, Mich.
Magruder, E. W., Agricultural College, Miss.
Miller, Harry East, 1015 Chestnut St., Oakland, Cal.
Pennington, Mary E., 2 Hillhouse Ave., New Haven, Conn.
Stocker, John H., 124 Hancock St., Brooklyn, N. Y.

MEETINGS OF THE SECTIONS.

COLUMBUS SECTION.

The recently organized Columbus Section decided to hold regular monthly meetings. Two of these have been held, the attendance and interest being all that could be desired.

On the evening of November 10th, Prof. C. C. Howard, who recently returned from study in Europe, presented the results of his investigation on "The Derivatives of *p*-Amidophenoxyacetic Acid." The interesting fact was noted that one of these derivatives, basic in character, forms an insoluble nitrate and serves as a delicate test for nitric acid.

Prof. H. A. Weber also presented a paper on "Root Tubercles in Water Culture." He also described an apparatus devised by him for carrying on experiments of this nature.

The evening of December 1st was given up to a discussion of Fischer's work on the sugars. A general review of the work was given by Prof. McPherson. This was followed by a general discussion in which all the members took part.

WILLIAM MCPHERSON, *Secretary*.

NEW YORK SECTION.

The regular meeting of the New York Section of the American

Chemical Society was held on Friday evening, January 7, at the College of the City of New York, Dr. Wm. McMurtrie presiding.

The following papers were read: G. C. Stone, "Exhibition of Some Unusual Manganese Alloys;" Parker C. McIlhiney, "A Method for Determining the Resistance of Electrolytes;" Morris Loeb, "Recent Speculations Concerning the Variability of Atomic Mass;" Fanny Hitchcock, "Note on the Reduction of Metallic Oxides at High Temperatures."

Mr. Stone exhibited samples of manganese alloys of the following composition:

	Spiegel.	White.	Gray.
Total carbon	4.92	4.45	3.98
Graphitic carbon	....	2.43	3.14
Silicon	1.94	1.51	3.25
Manganese	11.00	11.00	11.00
Phosphorus	0.04	0.04	0.04
Iron, sulphur, etc., difference	82.10	80.57	78.59
	100.00	100.00	100.00

The alloys were characterized by great hardness and strength, as compared with ordinary pig irons.

The advantage of Mr. McIlhiney's method of determining the resistance of electrolytes is the possibility of making readings at very short intervals. The more accurate method of Kohlrausch requires two minutes between readings, while by the method described a reading may be made every five seconds, which was necessary in the work for which the method was devised.

Prof. Loeb gave a very exhaustive review of the speculations in regard to variations of the atomic weights; the theories of condensation, of the "meta" elements, and of ideas in regard to simpler forms of matter. He protests against the notion that any simpler conditions would result from assuming that all elements are a form of one element, and considers that the acceptance of a reasonable number of forms of matter is a decided advantage.

Miss Hitchcock reported experiments showing that nitrogen is given off from tungsten and molybdenum oxides when reduced in a current of hydrogen. On decreasing the temperature the amount of nitrogen decreased and increased on again raising the heat. Argon and helium were not found.

The results obtained on other oxides indicate that nitrogen is generally present and is considered as a cause of obtaining low atomic weights by the reduction method. Further results are promised.

DURAND WOODMAN, *Secretary.*

Issued with March Number, 1898.

Proceedings.

COUNCIL.

It has been decided that the summer meeting of the society shall be held in connection with the meeting of Section C of the American Association for the Advancement of Science, the time to be divided between the two organizations, as at last year's summer meeting.

The following persons have been elected officers of the society in accordance with the provisions of the constitution:

Councilor—Horace L. Wells.

Directors for two years—C. F. Chandler and Wm. McMurtrie.

Directors for one year—C. A. Doremus, and C. B. Dudley.

Committee on Membership—P. T. Austen, A. A. Breneman, C. A. Doremus.

Committee on Finance—A. P. Hallock, A. H. Sabin, Durand Woodman.

Committee on Papers and Publications—Edward Hart, J. H. Long, T. B. Osborne.

Editor—Edward Hart.

The publisher of the Journal has been directed to furnish to the Committee on Atomic Weights 100 reprints of the annual report.

A committee of five persons, consisting of E. E. Ewell, chairman, Washington, D. C., G. E. Barton, Millville, N. J., C. E. Linebarger, Chicago, Ill., F. P. Venable, Chapel Hill, N. C., and L. P. Kinnicutt, Worcester, Mass., has been appointed to study and report upon the means by which this society can hasten the adoption of uniform systems of graduation, definite limits of accuracy, and standard methods for using all forms of measuring instruments in use in chemical laboratories. Further, the committee has been instructed to cooperate with other scientific bodies which have already undertaken this work, or which may enter upon it in the future.

NAMES PROPOSED FOR MEMBERSHIP.

Allen, Charles R., New Bedford High School, New Bedford, Mass.
Atwood, Wm. P., 11 Harding St., Lowell, Mass.
Aubert, A. B., Univ. of Maine, Orono, Me.
Badger, Ernest F., Expt. Station, Lawrence, Mass.
Bardwell, Fred. L., Mass. Inst. Tech., Boston, Mass.
Barlow, W. H., Mass. Inst. Tech., Boston, Mass.
Bassett, George O., 42 Farnsworth St., So. Boston, Mass.
Bassett, Wm. H., 236 Maxfield St., New Bedford, Mass.
Bates, H. R., Ashepoo Fertilizer Co., 143 E. Bay St., Charleston, S. C.
Baxter, Gregory P., Chem. Lab., Harvard College, Cambridge, Mass.
Beach, I. E., Lawrence, Mass.
Beardsley, Wallace B., 805 Amsterdam Ave., N. Y. City.
Blanchard, Arthur A., Newton Centre, Mass.
Bradford, Ernest, Ohio State Univ., Columbus, O.
Burnham, Guy J., Fitchburg, Mass.
Burns, Dr. Peter S., Mass. Inst. Tech., Boston, Mass.
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Chapin, Edward S., 23 Parker St., Boston, Mass.
Chapin, L. P., Mass. Inst. Tech., Boston, Mass.
Clapp, E. H., 620 Atlantic Ave., Boston, Mass.
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Coburn, Arthur S., care of C. B. Coburn & Co., Lowell, Mass.
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Dunlap, Frederick L., Worcester Poly. Inst., Worcester, Mass.
Durfee, Winthrop C., 81 Sedgwick St., Jamaica Plain, Boston, Mass.
Durkee, W. C., 392 Boylston St., Boston, Mass.
Fay, Henry, Mass. Inst. Tech., Boston, Mass.
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Gage, Stephen D., Expt. Station, Lawrence, Mass.
Glaesel, Theodore, 278 Centre St., Jamaica Plain, Boston, Mass.
Glasoe, Paul M., Univ. of Minn., Minneapolis, Minn.
Goodhue, Leonard H., 6 Chestnut St., Salem, Mass.

Goodrich, Arthur L., A 1 Berwick Park, Boston, Mass.
Graves, W. B., Andover, Mass.
Greenwood, Harry D., Everett Mills, Lawrence, Mass.
Hale, Frank M., 137 Glenwood Ave., Jersey City, N. J.
Hapgood, Charles W., Learnard & Bird Oil Co., Abattoir, Brighton, Mass.
Hayward, Harrison W., 79 Milton Ave., Hyde Park, Mass.
Hill, Wm. G., Jr., 84 Converse Ave., Malden, Mass.
Holman, Dr. Geo. M., Mass. Inst. Tech., Boston, Mass.
Holmes, V. F., Mass. Inst. Tech., Boston, Mass.
Hollis, Frederick S., Newton Highlands, Mass.
Hosford, Roger F., 42 Farnsworth St., South Boston, Mass.
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Jennings, W. L., Worcester Poly. Inst., Worcester, Mass.
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Kimberly, A. Elliott, State Expt. Station, Lawrence, Mass.
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Leach, Albert E., Room 501, State House, Boston, Mass.
LeBosquet, Maurice, 328 E. Eagle St., East Boston, Mass.
Lee, John C., Brookline, Mass.
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Loveland, James W., 184 Broadway, Cambridgeport, Mass.
Lythgoe, Hermann C., Winthrop, Mass.
Marble, J. Russel, Worcester, Mass.
Martin, Henry, South Gardiner, Me.
McGilton, Wm. W., Middlebury College, Middlebury, N. Y.
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Moat, C. P., 70 Middle St., Portsmouth, N. H.
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Moore, Hugh Kelsea, West Paris, Me.
Mulliken, Dr. Samuel P., Mass. Inst. Tech., Boston, Mass.
Neidich, Samuel A., A 1 Berwick Park, Boston, Mass.
Norris, James F., Mass. Inst. Tech., Boston, Mass.
Nye, Walter B., Cumberland Mfg. Co., Boston, Mass.
Olney, Louis A., Lowell Textile School, Lowell, Mass.
Ollson, Gustav, Everett, Mass.
O'Regan, D. F., Worcester Poly. Inst., Worcester, Mass.
Parker, Horatio N., 24 Shepard St., Cambridge, Mass.
Patch, Edgar L., 91 Broad St., Boston, Mass.
Phelan, J. W., Mass. Inst. Tech., Boston, Mass.
Pierce, Frank L., 31 Milk St., Boston, Mass.
Piper, Walter E., Boston Rubber Shoe Co., Fells, Mass.

Porter, Miss Georgia, Woburn, Mass.
Prescott, Samuel C., Mass. Inst. Tech., Boston, Mass.
Price, Raymond B., Boston Woven Hose & Rubber Co., Cambridgeport, Mass.
Reed, Ernest A., Boston Woven Hose Co., Cambridgeport, Mass.
Rice, Wm. F., 174 Prichard St., Fitchburg, Mass.
Richards, Mrs. Ellen H., Mass. Inst. Tech., Boston, Mass.
Richards, Prof. R. H., Mass. Inst. Tech., Boston, Mass.
Root, Wm. L., Mass. Inst. Tech., Boston, Mass.
Russell, L. Kimball, Mass. Inst. Tech., Boston, Mass.
Sauveur, Albert, 446 Tremont St., Boston, Mass.
Sawyer, Harris E., 37 Gates St., South Boston, Mass.
Sawyer, Walter H., 60 Congress St., Boston, Mass.
Scudder, Heyward, M.D., 29 Newberry St., Boston, Mass.
Sears, J. H., East Dennis, Mass.
Seidensticker, Lewis J., 95½ Inman St., Cambridge, Mass.
Sharples, Philip P., 13 Broad St., Boston, Mass.
Sherman, George W., Cambridgeport, Mass.
Simpson, E. T., care of Simpson & Rololand, Lowell, Mass.
Smith, John W., Mass. Inst. Tech., Boston, Mass.
Snyder, Wm. H., Worcester Academy, Worcester, Mass.
Stantial, Frank G., Everett, Mass.
Stevens, Edward K., 38 St. Botolph St., Boston, Mass.
Stickney, Miss Delia, 19 Trowbridge St., Cambridge, Mass.
Sullivan, J. M., Jackson, La.
Thayer, Fred. L., Rumford Chem. Works, Providence, R. I.
Thomas, Wm. H., Jr., care of Old Dominion Cotton Mills Co., Magog, P. Q.
Thorpe, Edward E., 711 Boylston St., Boston, Mass.
Torrey, Charles A., Jr., 44 Newbury St., Boston, Mass.
Trowbridge, P. F., 226 Observatory St., Ann Arbor, Mich.
Tucker, Greenleaf R., City Hospital, Boston, Mass.
Ulmer, George F., 543 Massachusetts Ave., Boston, Mass.
Underwood, George R., Peabody, Mass.
Wakefield, Frank P., 58 Eastern Ave., Boston, Mass.
Walker, Wm. H., Mass. Inst. Tech., Boston, Mass.
Walls, Arthur W., care of Merrimac Chem. Co., North Woburn, Mass.
Wason, Robert S., 61–63 Chatham St., Boston, Mass.
Watkins, Willard H., 33 Fisher St., Dover, N. H.
White, Miss Laura B., Girls' High School, Boston, Mass.
Wilder, Salmon W., Jr., Bellows Falls, Vt.
Wilson, Herman T., Glucose Sugar Ref. Co., Peoria, Ills.
Woodman, A. G., Mass. Inst. Tech., Boston, Mass.
Woodworth, E. Harold, Mass. Inst. Tech., Boston, Mass.

APPLICANTS FOR ASSOCIATE MEMBERSHIP.

Ashby, Geo. J. M., 890 Old Colony Bldg., Chicago, Ill.
Atteaux, F. E., 174 Purchase St., Boston, Mass.
Butler, Paul, Lowell, Mass.
Ellsworth, William, 30 Pine St., N. Y. City.
Frink, Cyrus L., 21 Pear St., Boston, Mass.
Hall, A. W., 15–17 Harcourt St., Boston, Mass.
Isaacs, A. S., 140 Sheffield St., Allegheny, Pa.
Shaw, John, 40 India Wharf, Boston, Mass.
Turnbull, Arthur, 38 Kilby St., Boston, Mass.

NEW MEMBERS ELECTED FEBRUARY 4, 1898.

Betts, Anson G., Lansingburgh, N. Y.
Chalon, P. F., 86 Rue Cardinet 86, Paris, France.
Deck, Rev. James, Georgetown Univ., Georgetown, D. C.
Elliott, Arthur H., 4 Irving Place, N. Y. City.
Elworthy, Herbert S., care of H. S. King & Co., 65 Cornhill, London, E. C.
Engle, Wilber D., 413 W. 145th St., N. Y. City.
Georgii, Max., 606 F St., Washington, D. C.
Gomberg, M., Univ. of Mich., Ann Arbor, Mich.
Gotthelf, August H., Hastings-on-Hudson, N. Y.
Griffin, John J., Catholic Univ. of America, Washington, D. C.
Harris, C. D., N. C. Agr. Expt. Station, Raleigh, N. C.
Jacobs, Chas. B., Ampère, N. J.
James, Joseph H., 1969 Amsterdam Ave., N. Y. City.
Jessurun, David, Lawrence, La.
Kastle, Dr. J. H., Agr. College, Lexington, Ky.
Lyons, Robert E., Ph.D., Bloomington, Ind.
Mahon, R. W., McKeesport, Pa.
Remsen, Prof. Ira, Johns Hopkins Univ., Baltimore, Md.
Riddell, Dell F., 1248 N. 27th St., Lincoln, Nebr.
Small, Fritz H., Smethport, McKean Co., Pa.
Watters, Leon L., 153 E. 56th St., N. Y. City.

ASSOCIATE ELECTED FEBRUARY 4, 1898.

Fernandez–Cavada, F., Audubon Expt. Station, New Orleans, La.

NEW MEMBERS ELECTED FEBRUARY 24, 1898.

Adams, Maxwell, Box 117, Chico, Calif.
Chamberlain, Geo. E., Glucose Works, Bush and Taylor Sts., Chicago, Ill.
Gere, Miss Mariel C., 849 D St., Lincoln, Nebr.
Gooch, Prof. F. A., Yale Univ., New Haven, Conn.

Guess, Harry A., care of Ottawa Gold Milling and Mining Co., Ltd., Keewatin, Ontario.
Langworthy, Dr. C. F., Dept. of Agr., Washington, D. C.
Maharg, W. S., City Hall, Chicago, Ill.
Miller, Alfred S., Moscow, Idaho.
Parker, Francis L., Jr., S. C. Mil. Acad., Charleston, S. C.
Thurnauer, Gustav, Chicago & Aurora Sm. & Ref. Co., Aurora, Ill.
Vreeland, Cornelius D., Chicago Heights, Ill.

ASSOCIATE ELECTED FEBRUARY 24, 1898.

Peppel, Samuel V., Ohio State Univ., Columbus, O.

CHANGES OF ADDRESS.

Adriance, John S., 105 E. 39th St., N. Y. City.
Barrett, Jesse M., Hammond, Ind.
Bevier, Miss Isabel, 64 W. Rutland Square, Boston, Mass.
Bradley, Edson, 45 Broadway, N. Y. City.
Fuller, Geo. W., 2106 Grand Ave., Walnut Hills, Cincinnati, Ohio.
Gudeman, Edward, care of Glucose Sugar Ref. Co., Taylor St. and The River, Chicago, Ill.
Kenan, W. R., Jr., Lake Superior Carbide Works, Sault Ste. Marie, Mich.
Maitland, Alexander, 45 Broadway, N. Y. City.
Peters, Andrew, 216 Park Pl., Brooklyn, N. Y.
Anderson, Chas. A., Box 730, Litchfield, Minn.
Twining, F. E., 319 11th St., Columbus, Ohio.
Waldstein, M. E., 107 Murray St., N. Y. City.
Wardman, G. B., Apartado 24, 2ª Ojocaliente num. 8, Aguascalientes, Mexico.
Zinsser, Fred. G., Hastings-on-Hudson, N. Y.

ADDRESSES WANTED.

Perry, Frank J., formerly of 2932 Prairie Ave., Chicago, Ill.
Proctor, R. W., 414 E. 4th St., Cincinnati, Ohio.

MEETINGS OF THE SECTIONS.

CINCINNATI SECTION.

The January meeting took place on Tuesday, January 18th, in the Lloyd Library, sixteen members being present, Prof. O. W. Martin in the chair.

Dr. Everhard Weber, care of The Procter and Gamble Co., Ivorydale, O. and Mr. August J. Spieler, care of The Emery Candle Works, Ivorydale, O., were elected members of this section. Mr. Ernst Twitchell read a valuable paper on "Products of the Action of Sulphuric Acid on Oleic Acid." Mr. Hayes-Campbell then reported on the manufacture of sugar from sugar-cane as practised in Louisiana.

After some discussion anent the defining of the territory of the section, as required by the amended constitution, the meeting, upon motion, adjourned.

The February meeting took place in the Lloyd Library, on Tuesday, February 18, ten members being present; Mr. Henry B. Foote was called to the chair.

Mr. George W. Fuller, chief chemist with the Cincinnati Water Works Commission, was elected a member of this section.

Prof. T. H. Norton gave an interesting historical review of the progress of applied electrochemistry. In the discussion on this subject, Mr. Fuller spoke at some length on the purification of water by the electric current.

Incidentally, Mr. Hayes-Campbell called attention to the commercial superiority of copper wire made by electrodeposition, on account of its greater purity and consequently its greater conductivity, the product of an American firm, having recently been preferred by the British Navy.

Mr. Hayes-Campbell then communicated a recently recorded analysis of a mechanical mixture of cast iron and phosphorus, which operation had the effect of almost doubling the tensile strength of the former, while part of the uncombined carbon was converted into combined carbon.

On motion, the meeting adjourned.

S. WALDBOTT, *Secretary.*

RHODE ISLAND SECTION.

The regular monthly meeting of the Rhode Island Section of the American Chemical Society was held at the Hope Club

House, Providence, January 27, 1898, with Mr. Edward D. Pearce as presiding officer.

After dinner, Dr. E. A. Fourneaux presented a paper on "Some Applications of Chemistry to the Printing of Fabrics." The reader described the different stages through which the calico printing industry has passed. Starting with a simple impression from an engraved object with a few coloring-matters, the business has gradually become complicated and difficult of operation. By means of certain chemicals printed on the cloth at first, it is possible to prevent the formation of color lakes and thus produce a white or to discharge the coloring-matter already placed on the fiber, and so produce a like effect.

WALTER E. SMITH, *Secretary*.

Issued with April Number, 1898.

Proceedings.

COUNCIL.

The Council has granted an application for the establishment of a local section of the society embracing the territory of Maine, New Hampshire, Vermont, and Massachusetts, with headquarters at Boston, Mass.

The edition of the Journal has been increased from 1500 to 1700 copies to meet the needs of the increased membership.

The President has been authorized to appoint a committee on exchanges with the Journal, and has named as members of such committee H. Carrington Bolton, Chairman, F. E. Dodge, Edward Hart, Edgar F. Smith, and F. W. Clarke.

The editor of the Journal has been authorized to furnish 100 reprints of their report to the Committee on Coal Analysis.

NAMES PROPOSED FOR MEMBERSHIP.

Carson, G. Prentice, DeLand, Fla.
Cate, Eleazar, 1 Linden St., Allston, Mass.
Fadi, Louis, Box 106, Perth Amboy, N. J.
Farwell, Seymour A., 472 Rutherford Ave., Charlestown, Mass.
Fosdick, E. H., care of Cal. Powder Works, Pinole, Cal.
Howard, Henry, 175 Mountfort St., Longwood, Mass.
Jackson, Daniel D., Flatbush Ave. and Eastern Parkway, Brooklyn, N. Y.
Kahn, Solly, Ph.D., care of Wm. S. Merrell Chem. Co., Cincinnati, O.
Moran, George A., So. Framingham, Mass.
Schleicher, Francis J., care of W. D. Wilson Printing Ink Co., 10th St., Long Island City, N. Y.
Smith, A. C., Waltham, Mass.
Stern, Heinrich, 1338 Lexington Ave., N. Y. City.
Van Slooten, William, 35 Wall St., N. Y. City.

NAME PROPOSED FOR ASSOCIATE MEMBERSHIP.

Ruhl, Louis, Box 1999, N. Y. City.

NEW MEMBERS ELECTED MARCH 24, 1898.

Allen, Charles R., New Bedford High School, New Bedford, Mass.
Atwood, Wm. P., 11 Harding St., Lowell, Mass.
Aubert, A. B., Univ. of Maine, Orono, Me.
Badger, Ernest F., Expt. Station, Lawrence, Mass.
Bardwell, Fred. L., Mass. Inst. Tech., Boston, Mass.
Bassett, Wm. H., 236 Maxfield St., New Bedford, Mass.
Bates, H. R., Ashepoo Fertilizer Co., 143 E. Bay St., Charleston, S. C.
Baxter, Gregory P., Chem. Lab., Harvard College, Cambridge, Mass.
Beach, I. E., Lawrence, Mass.
Beardsley, Wallace B., 805 Amsterdam Ave., N. Y. City.
Bradford, Ernest, Ohio State Univ., Columbus, O.
Burnham, Guy J., Fitchburg, Mass.
Burns, Peter S., Mass. Inst. Tech., Boston, Mass.
Chapin, L. P., Mass. Inst. Tech., Boston, Mass.
Clark, Harry W., Room 502, State House, Boston, Mass.
Coburn, Arthur S., C. B. Coburn & Co., Lowell, Mass.
Comey, Arthur M., Room 22, 620 Atlantic Ave., Boston, Mass.
Dickermann, Judson C., 11 Minot St., Woburn, Mass.
Doggett, Chas. S., Norwood, Mass.
Duckworth, Harry D., Cocheco Mfg. Co., Dover, N. H.
Dunlap, Frederick L., Worcester Poly. Inst., Worcester, Mass.
Durfee, Winthrop C., 81 Sedgwick St., Jamaica Plain, Boston, Mass.
Fay, Henry, Mass. Inst. Tech., Boston, Mass.
Forbush, Gayle T., 30 Kilby St., Boston, Mass.
Gage, Stephen D., Expt. Station, Lawrence, Mass.
Glasoe, Paul M., Univ. of Minn., Minneapolis, Minn.
Goodhue, Leonard H., 6 Chestnut St., Salem, Mass.
Graham, S. L., Rome, Ga.
Graves, W. B., Andover, Mass.
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Hayward, Harrison W., 79 Milton Ave., Hyde Park, Mass.

Hill, Wm. G., Jr., 84 Converse Ave., Malden, Mass.
Hollis, F. S., Newton Highlands, Mass.
Hosford, Rodger F., 42 Farnsworth St., South Boston, Mass.
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Martin, Henry, South Gardiner, Me.
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Moody, H. R., Winsted, Conn.
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Mulliken, Samuel P., Mass. Inst. Tech., Boston, Mass.
Neidich, Samuel A., A 1 Berwick Park, Boston, Mass.
Norris, James F., Mass. Inst. Tech., Boston, Mass.
Olney, Louis A., Lowell Textile School, Lowell, Mass.
Olsson, Gustaf, Everett, Mass.
O'Regan, D. F., Worcester Poly. Inst., Worcester, Mass.
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Phelan, J. W., Mass. Inst. Tech., Boston, Mass.
Piper, Walter E., Boston Rubber Shoe Co., Fells, Mass.
Porter, Miss Georgia, Woburn, Mass.
Prescott, Samuel C., Mass. Inst. Tech., Boston, Mass.
Price, Raymond B., Boston Woven Hose & Rubber Co., Cambridgeport, Mass.
Reed, Ernest A., Boston Woven Hose Co., Cambridgeport, Mass.
Rice, Wm. F., 174 Prichard St., Fitchburg, Mass.
Richards, Mrs. Ellen H., Mass. Inst. Tech., Boston, Mass.
Richards, Prof. R. H., Mass. Inst. Tech., Boston, Mass.
Roberts, Charles C., West Chester, Pa.
Root, William L., Mass. Inst. Tech., Boston, Mass.
Russell, L. Kimball, Mass. Inst. Tech., Boston, Mass.
Sauveur, Albert, 446 Tremont St., Boston, Mass.
Sawyer, Harris E., 37 Gates St., South Boston, Mass.
Sharples, Philip P., 13 Broad St., Boston, Mass.

Sherman, George W., Cambridgeport, Mass.
Simpson, E. T., care of Simpson & Rololand, Lowell, Mass.
Smith, John W., Mass. Inst. Tech., Boston, Mass.
Snyder, Wm. H., Worcester Academy, Worcester, Mass.
Stantial, Frank G., Everett, Mass.
Stetson, Frank O., 1802 R St., Washington, D. C.
Stevens, Edward K., 38 St. Botolph St., Boston, Mass.
Stevenson, J. Stewart, Box 902, Deadwood, S. D.
Stickney, Miss Delia, 19 Trowbridge St., Cambridge, Mass.
Sullivan, J. M., Jackson, La.
Thayer, Fred. L., Rumford Chem. Works, Providence, R. I.
Thomas, Wm. H., Jr., care of Dominion Cotton Mills Co., Magog, P. Q.
Trowbridge, P. F., 226 Observatory St., Ann Arbor, Mich.
Tucker, Greenleaf R., City Hospital, Boston, Mass.
Underwood, George R., Peabody, Mass.
Walker, Wm. M., Mass. Inst. Tech., Boston, Mass.
Walls, Arthur W., care of Merrimac Chem. Co., North Woburn, Mass.
Wason, Robert S., 61–63 Chatham St., Boston, Mass.
Watkins, Willard H., 33 Fisher St., Dover, N. H.
Wilder, S. W., Jr., Bellows Falls, Vt.
Woodman, A. G., Mass. Inst. Tech., Boston, Mass.
Woodworth, E. Harold, Mass. Inst. Tech., Boston, Mass.

ASSOCIATES ELECTED MARCH 24, 1898.

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Atteaux, F. E., 174 Purchase St., Boston, Mass.
Butler, Paul, Lowell, Mass.
Ellsworth, William, 30 Pine St., N. Y. City.
Frink, Cyrus L., 21 Pearl St., Boston, Mass.
Hall, A. W., 15–17 Harcourt St., Boston, Mass.
Isaacs, A. S., 140 Sheffield St., Allegheny, Pa.
Shaw, John, 40 India Wharf, Boston, Mass.
Turnbull, Arthur, 38 Kilby St., Boston, Mass.

CHANGES OF ADDRESS.

Doscher, Henry, 200 Hewes St., Brooklyn, N. Y.
Fullam, Frank L., West Brookfield, Mass.
Hall, Clarence A., care of Lake Superior Carbide Works, 6 East Madison St., Chicago, Ill.
Kelley, J. H., Chamber of Commerce (7th Floor), Nashville, Tenn.

Larchar, Arthur B., Penobscot Chem. Fibre Co., Great Works, Me.
Maywald, F. J., 72nd St. and 10th Ave., Bay Ridge Park, Brooklyn, N. Y.
Miller, P. Schuyler, 187 Sterling Pl., Brooklyn, N. Y.
Peale, Dr. A. C., 605 12th St., N. W., Washington, D. C.
Proctor, R. W., care of Wm. S. Merrell Chem. Co., 5th and Butler Sts., Cincinnati, Ohio.
Redding, Clifford R., Om. & Grant Sm. Co., Omaha, Nebr.
Schoen, Joseph, 3602 Lake Ave., Chicago, Ill.
Walker, Henry V., 40 Clinton St., Brooklyn, N. Y.

MEETINGS OF THE SECTIONS.

WASHINGTON SECTION.

The fourth annual meeting of the Washington Section of the American Chemical Society was held on January 13th. The following officers were elected for the ensuing year: H. N. Stokes, President; Peter Fireman and H. Carrington Bolton, Vice-Presidents; William H. Krug, Secretary; W. P. Cutter, Treasurer; and C. E. Munroe, E. A. de Schweinitz, Wirt Tassin, and W. F. Hillebrand, additional members of the Executive Committee.

The regular February meeting was held on Thursday evening, February 10th. Mr. Tassin presented a paper on "The Origin of Crystals and Crystalline Growth," which contained a résumé of theories concerning the origin of crystals and the processes of crystal-growth, and consisted of a discussion of the results of the researches of Vogelsang, Behrens, Knop, Sadebeck, and Lehmann.

Dr. H. Carrington Bolton read a paper entitled "Iatro-chemistry in 1897," in which he described the peculiar doctrines of two new schools of medicine, "electro-homeopathy" and "hermetic homeopathy," now popular in several countries in Europe. The former was founded in Italy by Count Mattei, who claimed to prepare an entirely new materia medica from plants by processes known only to the medieval iatro-chemists. Five of these chemical medicines are known as "vegetable elec-

tricities," and the varieties are distinguished by their colors. Great antiquity is claimed for this system. Van Helmont and Paracelsus are cited as forerunners of Mattei. Electro-homeopathy is favorable to astrology and to transmutation of metals; several monthly periodicals are devoted to its propagandism. Hermetic homeopathy is more recently established, and its claims are still more extravagant. Dr. Bolton gave examples of the manner of treating certain diseases according to the two schools, and remarked in conclusion:

"All this would be very amusing if it were not sad; sad to find that educated men can so degrade their knowledge of chemistry, physiology, and medicine; sad to think that the conceptions of these sciences formed by persons subject to the influence of these 'lewd impostors;' sad to think of the suffering that ensues for lack of proper treatment; sad to think of the unscrupulous immorality of those willing to trifle with human life for selfish gain. One is inclined to cry with Massinger:

> 'Out, you impostors,
> Quack-salving, cheating mountebanks, your skill
> Is to make sound men sick, and sick men kill!'"

Dr. H. W. Wiley addressed the society on the subject of pure food legislation and discussed the benefits which would undoubtedly result from the deliberations of the Pure Food Congress to assemble in Washington on March 2nd.

WILLIAM H. KRUG, *Secretary.*

NEW YORK SECTION.

The regular meeting was held on Friday evening, February 4th, Dr. Wm. McMurtrie presiding, and seventy-two members and visitors present.

The meeting was opened with an exhibition of liquid air and experiments by Drs. McMurtrie and Doremus, illustrating its properties. Alcohol was frozen, rubber tubing was rendered hard and brittle by the low temperature, and sheet iron after immersion in the liquid was easily broken.

The following papers were read: "Determination of Boric Acid," by T. S. Gladding; "Recent Progress in the Chem-

istry of the Leather Industry," by J. H. Yocum; "Review of Chemical and Physical Methods for Examining Documents and Handwriting," by C. A. Doremus.

DURAND WOODMAN, *Secretary.*

The regular monthly meeting was held March 11th, at the College of the City of New York, Dr. Wm. McMurtrie presiding.

On recommendation of the Executive Committee, the time for the election of officers was changed from October to the June meeting. The following papers were read:

"A New Bacteria Counter," by W. P. Mason. Read by Mr. Bogert in the absence of the author. "Action of Sulphuric Acid on Thymol," by J. H. Stebbins. "The Composition of the Ashes of Some Raw Tanning Materials, by Wm. K. Alsop and J. H. Yocum. "Some Laboratory Experiments on Standardizing and Investigating Viscometers," by P. H. Conradson. "Technology of Glue," by E. R. Hewett. Exhibition of samples.

Messrs. Alsop and Yocum found an unusually large amount of manganese in some of the ashes analyzed.

Dr. Conradson mentioned that there were about as many viscometers described as there were oils, and that they all left a great deal to be wished for. He gave a very interesting description of the various kinds in use, illustrating his remarks by charts and drawing. A general discussion followed.

The session was closed by a paper on the "Technology of Glue," by E. R. Hewett. Dr. Hewett gave a very complete description of the manufacture of glue, including its history and chemistry, and also exhibited a large number of specimens.

J. A. DEGHUEE, *Secretary pro. tem.*

RHODE ISLAND SECTION.

The regular monthly meeting of the Rhode Island Section of the American Chemical Society was held at the Hope Club House, Providence, February 24, 1898, with Mr. Edward D. Pearce as presiding officer.

After dinner, several members presented interesting topics. W. M. Saunders spoke briefly on the "Optical Pyrometer" and

demonstrated to some extent its application. E. D. Pearce showed a picture printed by the use of three screens, each carrying a color, but overlapping one another partly. Chas. A. Catlin showed, by means of the microscope and by some photographs, some starch granules with direct light and some with polarized light.

WALTER E. SMITH, *Secretary.*

Issued with May Number, 1898.

Proceedings.

REPORT ON NATIONAL PURE FOOD AND DRUG CONGRESS.

The participation of the American Chemical Society in this Congress was due to the receipt of the following letters of invitation:

NATIONAL PURE FOOD AND DRUG CONGRESS,
TO BEGIN MARCH 2, 1898.

WASHINGTON, D. C., February 7, 1898.

Prof. Chas. E. Munroe, Columbian University, Washington, D. C.

DEAR SIR: Enclosed please find call for a Pure Food Congress to meet on the second proximo. Your association is entitled to representation in said congress as you will see from the enclosed call. I would be obliged to you if you will kindly furnish me the names of the delegates and their addresses so that I can register them and furnish any information that may be necessary.

I am directed by the Local Committee to ask you as a resident of Washington to act as chairman of the committee of three, two others to be appointed by yourself, to serve from your association on the Executive Committee of our Local Pure Food Committee. The meeting of the Local Committee and of the Executive Committee will be held in Parlor 19 at the Metropolitan Hotel on Tuesday next, at 3.00 P.M. I trust that it will be agreeable to you and your associates to be present.

Hoping that you will take a decided interest in this important work, I am, Very respectfully,

ALEX. J. WEDDERBURN,
Secretary of Committee.

WASHINGTON, D. C., February 7, 1898.

Prof. Chas. E. Munroe, Columbian University, Washington, D. C.

DEAR SIR: Replying to yours of this date, I am sorry that I did not make myself clear in requesting you to appoint three members of your society (American Chemical Society), to attend the meeting of the Executive Committee in charge of local arrangements for the approaching Pure Food Congress. This was what I intended to request.

In the call for the Congress, the National Chemical Society, meaning the American Chemical Society, are entitled to five delegates. These delegates I presume you should appoint as members of the congress. I am not sufficiently informed in regard to the usages of your society, to know whether it would be your duty or that of each State association to appoint its own representatives. This is a matter which I presume you understand much better than I do. We have sent a copy of the call to every association as far as their names could be obtained. I desire you, as President of the A. C. S., to appoint five delegates, including yourself, of course, at large to act as delegates in the congress, also three members of your association, yourself, and two others, to act upon the Executive Committee, which will meet at Parlor 19, Metropolitan Hotel, to-morrow, Tuesday, at 3:00 P.M.

In regard to the financial liability, I can only say that the committee named above, up to the present time, have had no indebtedness incurred whatever, and our Local Committee still has a small amount of money in hand to continue its work of calling the congress together. While I am not authorized to say anything in regard to the matter, I presume when the congress is organized that the functions of our Local Committee cease and all matters of expense, etc., will be in the hands of the congress itself.

I presume some small amount of funds, probably two or three hundred dollars, may be needed to pay for the expenses of the congress, printing, etc., which the Executive Committee here may feel that it is to the interest of Washington to be provided by the various business interests of the city. This matter will be, of course, for the Executive Committee to decide for itself. As far as I can see, no association or individual will be called upon to advance more than $2 or $3 at the outside, and of course such contribution would be entirely volunteer on the part of the contributor. I hope that you and your associates will be with us to-morrow evening, and I am sure that we will have your hearty cooperation in this matter of such importance.

Very respectfully,

ALEX. J. WEDDERBURN,

Secretary of Committee.

These letters were forwarded to the Council with the following communication:

WASHINGTON, D. C., February 8, 1898.

To the Council of the American Chemical Society:

GENTLEMEN: I send you herewith copies of letters received from the Secretary of the Committee of the National Pure Food and Drug Congress, and I will have copies of the printed "Call" sent direct to you. I do not fully understand the origin of this movement or the influences behind it, but I do know that it is apparently being taken seriously; that the Surgeon-Generals of the Army and Navy have each designated delegates from their

respective corps; and that the ostensible object is to influence legislation.

As immediate action in regard to the Executive Committee seemed imperative, I have designated the President, Dr. H. Carrington Bolton and Dr. Wm. H. Seaman as members of the Executive Committee, their appointment and action in this committee to be subject to your approval.

To bring this matter before you, I make the following motions:

"*Moved*, That the President appoint five members of the Society as delegates at large to the National Pure Food and Drug Congress.

"*Moved*, That the President appoint one member from each of the Local Sections as a delegate from such section to the National Pure Food and Drug Congress.

"*Moved*, That the act of the President in appointing three members of the society as members of the Executive Committee of the Local Pure Food Committee, is approved of and the acts of said members in said Executive Committee are hereby ratified."

Respectfully submitted,

CHARLES E. MUNROE,
President.

As these motions were approved by the Council, the following delegates were appointed:

Members of Executive Committee of Local Pure Food Committee—Charles E. Munroe, H. Carrington Bolton, Wm. H. Seaman.

Delegates at Large—Henry Leffman, Charles E. Munroe, J. W. Mallet, Charles F. Chandler, Wm. McMurtrie.

Delegates from Local Sections—J. Howard Appleton, of Rhode Island Section; E. Twitchell, of Cincinnati Section; C. A. Doremus, of New York Section; W. D. Bigelow, of Washington Section; Edward Hart, of Lehigh Valley Section; A. L. Metz, of New Orleans Section; H. H. Nicholson, of Nebraska Section; J. P. Grabfield, of Chicago Section; F. P. Venable, of North Carolina Section; H. A. Weber, of Columbus Section.

The Congress, numbering several hundred delegates, met at the Columbian University, Washington, D. C., on Wednesday, March 2, 1898, and remained in session until Saturday, March 5th. Many addresses were made, among them being that of Dr. W. D. Bigelow, as retiring President of the Washington Section of this Society on "Legislation in Regard to Food Adulteration," and one by Dr. H. W. Wiley on "Food Adulterations."

The greater part of the time was occupied with the discussion of the bill which was introduced in the House of Representatives, on December 18, 1897, by Mr. Brosius. As a consequence of the action of this Congress, the bill was introduced again on March 15, 1898, in the following amended form:

A BILL

FOR PREVENTING THE ADULTERATION, MISBRANDING, AND IMITATION OF FOODS, BEVERAGES, CANDIES, DRUGS, AND CONDIMENTS IN THE DISTRICT OF COLUMBIA AND ITS TERRITORIES, AND FOR REGULATING INTERSTATE TRAFFIC THEREIN, AND FOR OTHER PURPOSES.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That for the purpose of protecting the commerce in food products and drugs between the several States and in the District of Columbia and the Territories of the United States and foreign countries the Secretary of Agriculture shall organize in the chemical division of the Department of Agriculture a food, beverage, and drug section, and make necessary rules governing the same to carry out the provisions of this Act, under direction of the chief chemist, whose duty it shall be to procure from time to time, under rules and regulations to be prescribed by the Secretary of Agriculture, and analyze or cause to be analyzed or examined, microscopically or otherwise, samples of foods, beverages, condiments, and drugs offered for sale in any State, District of Columbia, or Territory other than where manufactured, or from a foreign country, provided the same be in original or unbroken packages. The Secretary of Agriculture is hereby authorized to employ such chemists, inspectors, clerks, laborers, and other employees as may be necessary to carry out the provisions of this Act, and to make such publication of the results of examinations, analyses, and so forth, as he may deem proper.

Sec. 2. That the introduction into any State or Territory or the District of Columbia from any other State or Territory or the District of Columbia or foreign country of any article of food, drugs, or condiments which is adulterated or misbranded within the meaning of this Act is hereby prohibited, and any person who shall ship or deliver for shipment from any State or Territory or the District of Columbia or foreign country to any other State or Territory or the District of Columbia, or to a foreign country, or who shall receive in any State or Territory or the District of Columbia from any other State or Territory or the District of Columbia or foreign country, or who, having received, shall deliver, for pay or otherwise, or offer to deliver to any other person, in original unbroken packages, any such article so adulterated or misbranded within the meaning of this Act, or any person who shall sell or offer for sale in the District of Columbia or the Territories of the United States such adulterated, mixed, misbranded, or imitated foods, beverages, condiments, or drugs shall be guilty of a misdemeanor, and for such offense be fined not exceeding two hundred dollars for the first offense and for each subsequent offense not exceeding three hundred dollars, or be imprisoned not exceeding one year, or both, in the discretion of the court.

Sec. 3. That the chief chemist shall make, or cause to be made, under rules and regulations to be prescribed by the Secretary of Agriculture, examinations of specimens of food, beverages, condiments, and drugs offered for sale in original or unbroken packages in any State or Terri-

tory other than where manufactured or from any foreign country which may be collected from time to time, under rules and regulations to be prescribed by the Secretary of Agriculture, and under his direction, in various parts of the country. If it shall appear from such examination that any of the provisions of this Act have been violated the Secretary of Agriculture shall at once certify the facts to the proper United States district attorney, with a copy of the results of the analysis duly authenticated by the analyst under oath.

Sec. 4. That it shall be the duty of every district attorney to whom the Secretary of Agriculture shall report any violation of this Act to cause proceedings to be commenced and prosecuted without delay for the fines and penalties in such case provided.

DEFINITIONS.

Sec. 5. That the term "drug," as used in this bill, shall include all medicines recognized in the United States Pharmacopœia and National Formulary and cosmetics for internal or external use. The term "food," as used herein, shall include all articles used for food, candy, drink, or condiment by man or domestic animals, whether simple, mixed, or compound. The term "misbranded," as used herein, shall include all drugs, or articles of food, or articles which enter into the composition of food or condiments, the package or label of which shall bear any statement purporting to name any ingredients or substances as not being contained in such article, which statement shall be false in any particular; or any condiment or food product which is falsely branded as to the State or Territory in which it is manufactured or produced.

ADULTERATIONS.

Sec. 6. That for the purposes of this Act an article shall be deemed to be adulterated—

In case of drugs:

First. If, when a drug is sold under or by a name recognized in the United States Pharmacopœia, it differs from the standard of strength, quality, or purity, according to the tests laid down in the United States Pharmacopœia, official at the time of the investigation.

Second. If, when sold under or by a name not recognized in the United States Pharmacopœia, but which is found in the National Formulary, it differs from the standard of strength, quality, or purity, according to the tests laid down in said work.

Third. If its strength or purity fall below the professed standard under which it is sold.

Fourth. If it be an imitation of and sold under the specific name of another article.

In the case of food, candy, or drink:

First. If any substance or substances has or have been mixed and packed with it so as to reduce or lower or injuriously affect its quality or strength, so that such product, when offered for sale, shall deceive or tend to deceive the purchaser.

Second. If any inferior substance or substances has or have been substituted wholly or in part for the article, so that the product, when sold, shall deceive or tend to deceive the purchaser.

Third. If any valuable constituent of the article has been wholly or in part abstracted, so that the product, when sold, shall deceive or tend to deceive the purchaser.

Fourth. If it be an imitation of and sold under the specific name of another article.

Fifth. If it be mixed, colored, powdered, or stained in a manner whereby damage or inferiority is concealed, so that such product, when sold, shall deceive or tend to deceive the purchaser.

Sixth. If it contain any added poisonous ingredient or any ingredient which may render such article injurious to the health of the person consuming it.

Seventh. If it be labeled or branded so as to deceive or mislead the purchaser, or purport to be a foreign product when branded so, or is an imitation, either in package or label, of an established proprietary product which has been trade-marked or patented.

Eighth. If it consists of the whole or any part of a diseased, filthy, decomposed, or putrid animal or vegetable substance, or any portion of an animal unfit for food, whether manufactured or not, or if it is the product of a deceased animal, or of an animal that has died otherwise than by slaughter.

Ninth. That candies of domestic manufacture and chocolate of domestic manufacture may be deemed to be adulterated if they contain terra alba, barytes, talc, chrome yellow, or other mineral substances or poisonous colors or flavors, or other ingredients deleterious or detrimental to health: *Provided*, That an article of food, beverage, condiment, or drug which does not contain any added poisonous ingredients, shall not be deemed to be adulterated in the following cases: First. In the case of mixtures or compounds which may be now or from time to time hereafter known as articles of food, beverages or condiments under their own distinctive names, and not included in definition fourth of this section. Second. In the case of articles labeled, branded, or tagged so as to plainly indicate that they are mixtures, compounds, combinations, imitations, or blends. Third. When any matter or ingredient has been added to the food, beverage, or condiment, because the same is required for the production or preparation thereof as an article of commerce in a state fit for carriage or consumption, and not fraudulently to increase the bulk, weight, or measure of the food, beverage, or condiment, or conceal the inferior quality thereof: *Provided*, That the same shall be labeled, branded, or tagged, as prescribed by the Secretary of Agriculture, so as to show them to be compounds, and the exact character thereof: *And provided further*, That nothing in this Act shall be construed as requiring or compelling proprietors or manufacturers of proprietary foods to disclose their trade formulas, except in so far as the provisions of this bill may require to

secure freedom from adulteration or imitation. Fourth. Where the food, beverage, condiment, or drug is unavoidably mixed with some harmless extraneous matter in the process of collection or preparation: *Provided further*, That no retailer shall be convicted under the provisions of this Act when he is able to prove a written guaranty of purity, in a form approved by the Secretary of Agriculture, as published in his rules and regulations, signed by the wholesaler, jobber, manufacturer, or other party from whom he purchased said articles. Said guaranty shall contain the full name and address of the party or parties making the sale to the retailer, and said party or parties shall be amenable to the prosecutions, fines, and other penalties which would attach in due course to the retailer under the provisions of this Act.

Sec. 7. That the Secretary of Agriculture is hereby authorized to cause all compounds, mixed, or blended products to be properly branded and prescribe how this shall be done.

Sec. 8. That it shall be the duty of the Secretary of Agriculture to call upon the Association of Official Agricultural Chemists, and such physicians, not less than five, as the President of the United States shall select from the Medical Department of the Army, the Navy, and the United States Marine Hospital, and five chemists to be selected by the American Chemical Society, to determine jointly the standard of all food products (within the meaning of this Act), and when so determined such standards shall guide the chemists of the Department of Agriculture in the performance of the duties imposed upon them by this Act, and shall remain the standards before all courts. It shall be the duty of the Association of Official Agricultural Chemists and the medical officers before mentioned to confer with and consult the duly accredited representatives of all industries for which standards shall be established under the provisions of this Act.

Sec. 9. That every person who manufactures for shipment and delivers for transportation from any State, Territory, or the District of Columbia, to any other State, Territory, or the District of Columbia, any drug, condiment, beverage, or article of food, and every person who exposes for sale or delivers to a purchaser any drug, condiment, beverage, or article of food received from a State, Territory, or the District of Columbia, other than the State, Territory, or the District of Columbia in which he exposes for sale or delivers such drug, beverages, or article of food, and which article is in the original unbroken package in which the same was received, shall furnish within business hours and upon tender and full payment of the selling price a sample of such drugs, condiments, beverages, or articles of food to any person duly authorized by the Secretary of Agriculture to receive the same, and who shall apply to such manufacturer or vender or person delivering to a purchaser such drug, beverage, or article of food for such sample for such use, in sufficient quantity for the analysis of any such article or articles in his possession. And in the presence of such dealer and an agent of the Department of

Agriculture, if so desired by either party, said sample shall be divided into three parts, and each part shall be sealed by the seal of the Department of Agriculture. One part shall be left with the dealer, one delivered to the chemist of the Department of Agriculture, and one deposited with the United States district attorney for the district in which the sample is taken. Said manufacturer or dealer may have the sample left with him analyzed at his own expense, and if the results of said analysis differ from those of the chemist of the Department of Agriculture, the sample in the hands of the district attorney shall be analyzed at the expense of said manufacturer or dealer by a third chemist, who shall be appointed by the president of the Association of Official Agricultural Chemists of the United States, and the analysis shall be conducted in the presence of the chemist of the Department of Agriculture and the chemist representing the dealer, and the whole evidence shall be laid before the court.

Sec. 10. That any manufacturer or dealer who refuses to comply, upon demand, with the requirements of Section 9 of this Act shall be guilty of a misdemeanor, and upon conviction shall be fined not exceeding one hundred nor less than ten dollars, or imprisonment not exceeding one hundred nor less than thirty days, or both. And any person found guilty of manufacturing, or offering for sale, or selling an adulterated, impure, or misbranded article of food, condiment, or drug in violation of the provisions of this Act, shall be adjudged to pay, in addition to the penalties heretofore provided for, all the necessary costs and expenses incurred in inspecting and analyzing such adulterated articles which said person may have been found guilty of manufacturing, selling, or offering for sale.

Sec. 11. That this Act shall not be construed to interfere with commerce wholly internal in any State, nor with the exercise of their police powers by the several States.

Sec. 12. That any article of food, condiment, or drug that is adulterated within the meaning of this Act, and is transported, or is being transported, from one State to another for sale, or if it be sold or offered for sale in the District of Columbia and the Territories of the United States, shall be liable to be proceeded against in any district court of the United States, within the district where the same is found and seized for confiscation, by a process of libel for condemnation. And if such article is condemned as being adulterated, the same shall be disposed of as the said court may direct, and the proceeds thereof, if sold, less the legal costs and charges, shall be paid into the Treasury of the United States. The proceedings of such libel cases shall conform, as near as may be, to proceedings of admiralty, except that either party may demand trial by jury of any issue of fact joined in such case, and all such proceedings shall be at the suit of and in the name of the United States.

One of the most radical amendments is that recorded in Section 8, requiring the Secretary of Agriculture to call upon the

Association of Official Agricultural Chemists, five medical officers in the Government services, and five chemists selected by the American Chemical Society to determine jointly the standard of all food products, but there is some doubt as to whether such a law would be constitutional.

Action was taken to make the Congress a permanent body, holding annual meetings, but this society is in no way committed to such action.

CHARLES E. MUNROE,
President.

COUNCIL.

The editor has been directed to send out all copies of the Journal hereafter without trimming. This has been ordered so as to allow greater margin to the pages in binding.

NAMES PROPOSED FOR MEMBERSHIP.

Babb, Edward E., 61 Myrtle St., Boston, Mass.
Bartlett, Spaulding, Webster, Mass.
Bennett, Frank W., 13 Broad St., Boston, Mass.
Benson, David H., North Weymouth, Mass.
Buffington, Elisha L., 33 Chestnut St., Worcester, Mass.
Busby, Fred. Edward, Mass. Inst. Tech., Boston, Mass.
Clark, Allan Jay, Lead, S. D.
Cottle, George Thurston, 13 Copley St., Roxburg, Mass.
Cowen, George A., 26 Adelaide St., Jamaica Plain, Mass.
Ellms, Joseph Welton, 1545 Blair Ave., Cincinnati, O.
Herrick, Rufus F., 22 Herrick St., Winchester, Mass.
James, G. A., Selby P. O., Contra Costa Co., Cal.
Lorenz, Henry W. F., Ph.D., 57 E. Columbia St., Springfield, O.
Nicholls, George A., Box 926, Deadwood, S. D.
Pratt, Gilbert H., Room 502, State House, Boston, Mass.
Pratt, Dr. Joseph H., Chapel Hill, N. C.
Pugh, A. H., care of A. H. Pugh Co., Walnut St., Cincinnati, Ohio.
Quinan, Kenneth B., Pinole, Contra Costa Co., Cal.
Randall, N. M., care of Md. Steel Co., Sparrows Point, Md.
Schreiber, Fred. T., Ocala Mining Lab., Ocala, Fla.
Spencer, Carl G., 259 Park Ave., Worcester, Mass.
Sylvester, John P., Harvard Chem. Lab., Cambridge, Mass.
Thrasher, Edward G., 18 Lancaster St., Worcester, Mass.
White, Geo. Rantoul, Exeter, N. H.

NAMES PROPOSED FOR ASSOCIATE MEMBERSHIP.

Ellis, Carleton, 195 Winchester St., Keene, N. H.
Hall, C. A., Union Carbide Co., Niagara Falls, N. Y.
Gabriel, George A., 8 Melville St., Worcester, Mass.
Gagnebin, C. L., 136 Milk St., Boston, Mass.
Hobbs, Alex. F., Merrimac Print Works, Lowell, Mass.
Howe, Chester A., 92 State St., Boston, Mass.
Koch, F. C., Champaign, Ill.
Pope, Wm. C., The Armstrong Mfg. Co., Boston, Mass.
Wolcott, J. T., 1409 W. Clark St., Urbana, Ill.

NEW MEMBERS ELECTED APRIL 19, 1898.

Bassett, Geo. O., 42 Farnsworth St., So. Boston, Mass.
Carson, G. Prentice, DeLand, Fla.
Cate, Eleazer, 1 Linden St., Allston, Mass.
Fadi, Louis, Box 106, Perth Amboy, N. J.
Farwell, Seymour A., 472 Rutherford Ave., Charlestown, Mass.
Glaesel, Theodore, 278 Centre St., Jamaica Plain, Boston, Mass.
Howard, Henry, 175 Mountfort St., Longwood, Mass.
Jackson, Daniel D., Flatbush Ave. and Eastern Parkway, Brooklyn, N. Y.
Kahn, Solly, Ph.D., care of Wm. S. Merrell Chemical Co., Butler St., Cincinnati, O.
Lanzendoerfer, George, 280 Dover St., Boston, Mass.
McGilton, Wm. W., Middlebury College, Middlebury, N. Y.
Moran, Geo. A., So. Framingham, Mass.
Patch, E. L., 91 Broad St., Boston, Mass.
Schleicher, Francis J., 10th St., Long Island City, N. Y.
Smith, A. C., Waltham, Mass.
Thorpe, Edward E., 711 Boylston St., Boston, Mass.

ASSOCIATES ELECTED APRIL 19, 1898.

Ruhl, Louis, Box 1, N. Y. City.

CHANGES OF ADDRESS.

Barrows, W. A., Jr., Mahoning Valley Iron Co., Youngstown, O.
Best, Dr. Otto, 1021 Sutter St., San Francisco, Cal.
Dortch, F. W., 813 Lea Ave., Nashville, Tenn.
Duffield, Dr. Samuel P., Dearborn, Wayne Co., Mich.
Eichberg, J. H., Groton Bldg., N. E. Cor. 7th and Race Sts., Cincinnati, O.
Enequist, John, 1094 Bergen St., Brooklyn, N. Y.
Fennel, C. T. P., E. Cor. 8th and Race Sts., Cincinnati, O.
Hayes-Campbell, J., P. J. Sorg Tobacco Co., Middletown, O.
Keller, Edward, Copper Works, Canton, Md.
Krause, Dr. O. H., 345 Fairmount Ave., Jersey City, N. J.

Linebarger, C. E., 533 Berenice Ave., Chicago, Ill.
Maury, Geo. P., Virginia, St. Louis Co., Minn.
Mooers, Chas. A., N. La. Expt. Sta., Calhoun, La.
Newell, Lyman C., State Normal School, Lowell, Mass.
Steiger, Geo., 1361 Yale St., N. W., Washington, D. C.
Voorhees, S. S., Office Alexandria, Virginia House, 904 Prince St., Alexandria, Va.

ADDRESS WANTED.

Meisel, C. F. A., formerly of 402 Washington St., New York City.

MEETINGS OF THE SECTIONS.

NORTH EASTERN SECTION.

A meeting for the purpose of organizing a local section of the American Chemical Society was held in Boston at the Parker House, on February 4th. About 150 chemists were in attendance. An application for a local charter was signed; and the following officers were elected: President, A. A. Noyes, Massachusetts Institute of Technology; Vice-President, L. P. Kinnicutt, Worcester Polytechnic Institute; Treasurer, B. F. Davenport, Boston; Secretary, W. R. Whitney, Massachusetts Institute of Technology. An Executive Committee was appointed consisting of the above officers, together with John Alden, Pacific Mills, Lawrence, Mass.; A. D. Little, Boston; H. Carmichael, Boston; John Shaw, Boston; and H. P. Talbot, Massachusetts Institute of Technology. It was voted that the territory covered by the section comprise the states of Massachusetts, New Hampshire, Maine, and Vermont. A Committee on By-Laws was appointed by the president.

The second meeting was held at the Parker House, Boston, March 25th, with 150 members present. A paper, illustrated by experiments, was presented by A. A. Noyes, the subject being "The Dissociation Theory of the Condition of Salts in Solution and Some of Its Important Applications." After the discussion of this paper, a recess was taken to furnish opportunity for social intercourse. A second paper was then presented by John Alden, Chemist of the Pacific Mills, Lawrence, on "The Production of the Direct Azo Colors on the Fiber." This was also illustrated by experiments and by a large number of

samples of the dyed colors. Members were also presented with a folder, specially prepared for the occasion, containing samples of the dyed goods with descriptions of the processes of preparation, etc. It was voted at this meeting that the name of the section be made the North Eastern Section. Some new apparatus was exhibited by Richards & Co., of New York.

W. R. WHITNEY, *Secretary.*

CINCINNATI SECTION.

The March meeting of the Section was held in the Lloyd Library on Tuesday, March 15th, with twenty members and several guests present, and Professor O. W. Martin in the chair.

The chairman exhibited a number of specimens of gunpowder and guncotton, and in this connection gave some interesting information as to their physical and technical properties.

Mr. Louis Werk then read a paper on the determination of sulphur in coal, giving in tabulated form the results of numerous analyses of a certain specimen of coal, carried out according to the methods of Eschka, Wiley, and Carius. The paper included a series of experiments undertaken to determine the amount of barium chloride which is precipitated along with barium sulphate from sulphuric acid solution.

Dr. R. Monroe McKenzie then read a paper on "Some Double Chlorides of Ferric and Ferrous Iron with Some Aromatic Bases," *viz.*, aniline and the three toluidines.

Dr. Alfred Springer made an informal report on the qualitative analyses of two distilled waters which had been sent to his laboratory the day before.

The first water, when evaporated to dryness, left a white residue or rather coating on the glass dish; when heated, it gave a distinct odor of coniferine. Taking some coniferine to make comparative tests, it was found that both—besides showing the usual reaction with phenol and hydrochloric acid—turned solutions of potassium permanganate a bright cherry red, and potassium manganate an emerald green; even traces of coniferine had this effect. Upon inquiry it was ascertained that the distilled water had been stored in a cypress tank.

The second water, very clear in appearance, as soon as heated, produced a black scum, which adhered to the sides of the con-

taining vessel when evaporated to dryness. The residue proved to contain copper in such quantity that the residue from one liter was sufficient to plate a platinum dish besides serving for a half dozen different tests. In order to compare the delicacy of the well-known reagents, Dr. Springer found that hydroxylamine hydrochloride showed the presence of copper in the original water, whereas it required evaporation to about one-sixteenth of the original volume to produce either the ammonia or the ferrocyanide reaction.

Inquiry developed that the water had been pumped directly from an artesian well into a still. Undoubtedly, as Dr. Springer remarked, the free carbon dioxide as well as that liberated from the bicarbonates in the water, produced the solvent action on the copper pipes.

On motion, the meeting adjourned.

S. WALDBOTT, *Secretary.*

COLUMBUS SECTION.

The following papers were presented at the regular meetings held in March and April:

1. "The Results of the Chemical Investigation of the Water of the Scioto River," by Professor N. W. Lord.

This work was carried on under the auspices of the State Board of Health, and will be published by the Board. The object in view was a critical study of the river waters of Ohio. The result of a large number of analyses of waters taken from different places and at different periods, was given and interesting conclusions drawn.

2. "The Nerve Cell as Presented by the Newer Methods of Research," by Dr. A. M. Bleile, an associate member of the Section.

3. "The Solution of Chemical Problems," by O. R. Flynn. The author gave his methods of presenting this subject to students.

4. "Effect of an Excess of Reagent in the Precipitation of Magnesium Ammonium Phosphate," by C. W. Foulk. The following is a brief abstract of the paper:

A series of experiments was made by precipitating fixed amounts of magnesium ammonium phosphate under carefully

regulated conditions which were made to agree as clearly as possible with ordinary analytical operations. The time of standing after precipitation and before filtration and the amount of reagent added were varied. Filtrations were made varying from two hours to half an hour after precipitation. In every case it was found that complete precipitation was effected provided sufficient reagent was added. Decreased time of standing required the addition of more precipitating reagent. No essential difference in the excess of reagent required was noted between precipitating Mg ions with PO_4 ions and *vice versa*, or between large and small amounts of precipitate in proportionate volume, excepting in the case of precipitating very small amounts of sodium hydrogen phosphate with magnesium chloride. Here the results seemed to show that relatively more magnesium salt is required to effect complete precipitation in half an hour. A number of comparative results was also given to show that in the presence of molybdic acid, *i. e.*, where the PO_4 ions had been separated with molybdate solution—a very much smaller excess of Mg ions is required to effect complete precipitation. The author desires to carry the investigation somewhat further before publishing the results as a whole.

Messrs. E. F. Watson and A. C. Ehrenfeld were duly elected members of the Section. WILLIAM MCPHERSON, *Secretary.*

WASHINGTON SECTION.

The regular monthly meeting was held on March 10, 1898.

Dr. E. A. de Schweinitz presented a paper on "The Pasteur Milk Laboratory of Washington." The speaker first reviewed briefly some of the ways in which milk can become infected, either from the fact that the animals are dirty and the stables in a filthy condition, or from the carelessness of the milkers, the dirty condition of the pans and pails and the use of impure water for washing these utensils. Attention was also called to the fact that dogs, cats, rats, mice, etc., which often obtain access to the place where the milk is ordinarily kept in the country, may affect the milk, as it is well known that these animals are often carriers of the germs of disease. In view of all these well-known dangers, and especially the fact that many outbreaks of typhoid fever have been traced directly to an

impure milk supply, the Medical Society of the District of Columbia has endeavored to introduce a good milk by appointing a committee to supervise a dairy and laboratory conducted on thoroughly hygienic principles.

Such a dairy has been established and all possible precautions are observed. The milk is obtained from healthy tuberculin-tested cattle. These are kept in a well-ventilated, clean stable with a cement floor. Before milking, the animals are carefully cleaned and curried, and taken into a smaller building designed for a milking room and kept as far as possible free from dust. The milk is immediately passed through a separator and cooled to about 45°. It is then brought to the bottling laboratory in cans, where it is placed in thoroughly clean sterilized bottles, which are sealed with paraffined paper caps. This milk is called sanitary milk to distinguish it from other milk which is still further improved by pasteurization. Ordinary milk may contain about 60,000 to 2,000,000 or 3,000,000 of bacteria per cubic centimeter, whilst by the above method a milk has been obtained which contained only from 1,200 to 3,000 bacteria per cubic centimeter.

Dr. Hillebrand read a paper on "The Colorimetric Estimation of Small Amounts of Chromium with Special Reference to Rocks and Minerals." The time required for the separation of chromium from certain other constituents which have likewise to be determined in rock and ore analysis is very considerable. The amounts in question are often extremely small and the separations are therefore more or less imperfect, hence a rapid and accurate method for these small amounts is very much needed, and seems to be fully afforded by a comparison of the color of an alkaline solution of the chromium as chromate with a similar solution containing a known amount of chromium. The method was thoroughly tested with prepared chromium solutions whose contents ranged in amounts from one mgm. to seven and five-tenths mgms., counted as chromic oxide, in varying dilution, though the figures given by no means represent the limits of the method. The standards employed contained potassium chromate, corresponding to one-tenth and two-tenths mgm. per cubic centimeter respectively, of chromic oxide, and in making the determinations were always diluted to agree with the pur-

posely made weaker test solutions. The maximum and minimum deviations from the truth for thirty-eight observations were +0.32 and —0.26 mgm., the average error being a little less than +0.02 mgm.

The method was given a severe practical test by adding to several grams of an iron ore, and also to a silicate, known amounts of chromium and subjecting the mixture to fusion with sodium carbonate and potassium nitrate, precipitating phosphorus pentoxide, vanadium pentoxide, and chromium trioxide from the aqueous extract with mercurous nitrate, igniting the precipitate, fusing the residue with sodium carbonate and thus obtaining a small bulk of highly colored solution. The results were equal to those of the preliminary tests and show the method to be highly accurate for small and moderate amounts of chromium. When there is enough chromium in a sample to give a sufficiently colored extract of the original alkali fusion, the color comparison may be made at once with this solution and this much time may be saved. Manganese, however, must be thoroughly removed, most quickly by reduction with methyl alcohol. The glasses used by the author were shown and the simple precautions for securing proper illumination were described. For amounts less than one mgm. it is best to use Nessler tubes.

Mr. Tassin exhibited specimens of products obtained in Moissan's electric furnace, consisting of carbides of aluminum, boron, iron, cobalt, cerium, and calcium, the elements molybdenum, uranium, tungsten, titanium, and chromium, and a piece of iron containing a diamond. The high temperature, which it is possible to obtain with this furnace, was illustrated by a specimen of fused lime.

Dr. Bolton presented a postscript to his paper on "Early American Chemical Societies," which he read at the meeting held on April 8, 1897. He called attention to a club of German chemists which was organized in New York in the winter of 1863–64. The president of the club was Dr. Friedrich Hoffman, and prominent among its members were Ferdinand F. Meyer, M. Alsberg, and Isidore Walz.

WILLIAM H. KRUG, *Secretary.*

Issued with June Number, 1898.

Proceedings.

CONSTITUTION AND BY-LAWS OF THE AMERICAN CHEMICAL SOCIETY.

ARTICLE I.

NAME.

This Society shall be known as the AMERICAN CHEMICAL SOCIETY.

ARTICLE II.

OBJECTS.

The objects of the Society shall be the advancement of chemistry and the promotion of chemical research.

ARTICLE III.

MEMBERSHIP.

SECTION 1. The Society shall consist of Members, Life Members, Honorary Members, Associates, Life Associates, and Honorary Associates.

SEC. 2. Any person who has had adequate training in chemistry may be nominated for election as a Member.

SEC. 3. Any person interested in the promotion of chemistry may be nominated for election as an Associate.

Associates shall have all the privileges of Members, except the rights of voting, holding office, and serving on committees.

SEC. 4. Any person who shall have been nominated in writing by three members of the Society, and whose nomination shall have been endorsed by a majority of the Committee on Membership, and whose name as a candidate for membership shall have been published in the Journal of the Society, shall be eligible for election as Member or Associate, as nominated.

SEC. 5. The names of all persons nominated in due form as Members or Associates, and approved by the Committee on Membership, shall be forwarded by said Committee to the Secretary and shall be sent by the Secretary to the Council, in whom the power of their election shall be vested.

SEC. 6. Any Member or Associate, not in arrears, paying at any one time the sum of one hundred dollars into the treasury of the Society, as commutation for dues, shall become a Life Member or Life Associate, shall be exempt from the further payment of annual dues, and shall receive all the regular publications of the Society.

SEC. 7. Any person who has rendered eminent service to the Society, may be made an Honorary Associate by a two-thirds vote of the Council. Honorary Associates shall be entitled to all the privileges of Members, except eligibility to office and serving on Committees.

SEC. 8. Any person whose achievements in chemistry may be considered as entitling him to special recognition as an authority in theoretical or applied chemistry, may be nominated for election as an Honorary Member. Such nomination must be presented in writing by ten members of the Society, and, in addition, must receive the written endorsement of a majority of the Council before the person so nominated shall be eligible for election.

SEC. 9. Election to Honorary Membership shall be made only in a general meeting of the Society.

Honorary Members and Honorary Associates shall be notified of their election by the Secretary, who shall also forward to them an engrossed certificate of their election, signed by the President and Secretary and a majority of the Council. They shall be exempt from the payment of any dues or fees, and shall receive the regular publications of the Society.

SEC. 10. The name of any member may be dropped from the roll of the Society by a three-fourths vote of the Council, and said person shall thereupon cease to be a member, after proper investigation, in which said member shall have been notified of the nature of the charges against him, and shall have been given an opportunity to answer them.

ARTICLE IV.

OFFICERS AND MANNER OF ELECTION.

SECTION 1. The officers of the Society shall be a President, one Vice-President for each Local Section, who shall be the presiding officer thereof, a Secretary, a Treasurer, an Editor, a Librarian, six Directors, and a Council.

SEC. 2. The President and twelve members of the Council shall be elected as prescribed in Section 4.

SEC. 3. The Council, which shall be the general governing body of the Society, shall consist of the President, the Past Presidents, the Secretary, and the Editor of the Society *ex-officiis*, one representative elected by each Local Section for each one hundred members of the Society in full standing, or fraction thereof it may have, and twelve members elected at large, one-third of the latter number being chosen each year.

All Past Presidents shall be members of the Council until they shall express their desire to be relieved from the duties of said position.

The Secretaries of the Local Sections shall certify to the Secretary of the Society on or before December 15th of each year the names and addresses of all the members of their respective Sections, and the names and addresses of the members who are to represent the Local Sections in the Council for the following year.

The President and Secretary of the Society shall be President and Secretary, respectively, of the Council.

SEC. 4. At least two months before each annual meeting of the Society, the Secretary shall mail to each member a blank upon which he shall be entitled to express his choice for President and four Councilors.

The Secretary, in conjunction with two other members to be designated by the President, shall count all ballots which shall be received within three weeks of the date of mailing the blanks, and shall certify to the result.

The Secretary shall mail to each member of the Council the names of the four persons who shall have been certified to have received the greatest number of nominating ballots for the office of President, and the Council shall elect the President of the Society from this list at least two weeks before the annual meeting of the Society.

The nominating ballots for the members of the Council shall also be canvassed and certified by the canvassing board, and the eight persons (or fewer, if not so many have been named) who shall have received the greatest number of nominating ballots, shall be placed in nomination for members of the Council.

If there be a tie vote among the required number of those who shall have received the highest number of votes for nomination for President or Councilors, the canvassers shall state this fact in their certificate, and all the names of said persons who shall have received the same number of ballots shall be placed in nomination.

The nominations for members of the Council shall be mailed to each member of the Society at least four weeks before the annual meeting.

Each member of the Society shall be entitled to vote for four of the candidates thus nominated, for members of the Council.

The ballots for the election of Councilors shall then be returned to the Secretary in a sealed envelope, with the name of the person voting written upon the ballot.

The Secretary, together with the other two canvassers appointed by the President, shall open and count all ballots cast by persons entitled to vote, but no ballot shall be counted unless the name of the person casting it appears upon the ballot, nor shall any ballot be counted if received later than two weeks previous to the annual meeting.

The result of the canvass for Councilors shall be declared by the President of the Society in the annual meeting, on certification of the Secretary and the two other members of the canvassing board. The four persons who shall have received the greatest number of ballots for members of the Council, and are not already members by election by the Local Sections or *ex-officiis*, as provided for in Article IV, Section 3, shall be declared elected Councilors. The result of the balloting for President shall be announced in the annual meeting by the President of the Society, upon certification of the Secretary. The person who shall have received a plurality of the votes cast by the Council for the office of President shall be declared elected to that office.

If there be a tie vote among the required number of those who shall have received the highest number of votes for the office of Councilor, the canvassers shall state this fact in their report to the President of the Society, and the President shall announce the same, and shall order a vote to be taken in the annual meeting to decide which one of the persons who shall have received the same number of ballots shall be chosen to fill the office, and the voting shall continue until some one person receives a plurality of the votes cast, when said person shall be declared elected.

The terms of the officers so elected shall be as follows: For the President, one year, beginning with the first day of January immediately following the annual meeting, or until his successor shall have been duly chosen; for the Councilors elected by the membership at large, three years, beginning with the first day of January immediately following the annual meeting, or until their successors shall have been duly chosen; for the Councilors elected by the Local Sections, one year, beginning with the first day of January immediately following the annual meeting, or until their successors shall have been duly chosen.

SEC. 5. The Secretary, Treasurer, Editor, Librarian, and two Directors shall be elected by the Council as soon after the annual meeting each year as is practicable, and the term of office of each of these officers, with the exception of the Directors, shall be one year, beginning with the first day of January immediately following the annual meeting, or until his successor shall have

been duly chosen. The term of office of the two Directors shall be two years, beginning with the first day of January immediately following the annual meeting, or until their successors shall have been duly chosen.

SEC. 6. In case of absence, death, or inability of the President to perform the duties of his office, his position shall be temporarily filled by one of the Vice-Presidents, the order of precedence being that of the dates of admission of the Vice-Presidents to membership in the Society.

SEC. 7. Any vacancies in office shall be filled by vote of the Council for the unexpired term of said office as soon as practicable after the vacancy occurs.

SEC. 8. The President and the Councilors elected by the Society at large shall be ineligible to election for a third consecutive term.

ARTICLE V.

DUTIES OF OFFICERS.

SECTION 1. The duties of the President, the Secretary, the Treasurer, and the Librarian shall be such as usually pertain to the offices they hold, and also any other duties that may be enumerated in any part of the Constitution or By-Laws of the Society or which may be properly prescribed by the Council. The Librarian shall act as Curator of all scientific or general collections, as well as books, periodicals, etc., belonging to the Society.

SEC. 2. The Directors shall be the legal representatives of the Society, and as such, under the general direction of the Council, and in conformity with the statutes of the State of New York, shall have, hold, and administer, all the property of the Society in trust for its uses. Their meetings shall be held at the call of the President of the Society, or of any three Directors. The President and Secretary shall be *ex-officiis* Directors, and the other four Directors shall be chosen by the Council from among their own number—two each year—in conformity with the provisions of Article IV, Section 5.

SEC. 3. With the exception of the President, the Directors, the Secretary, and the Editor, no officer shall be a member of the Council. But in case any one of these officers be designated to discharge the duties of any other office, as provided in Article V, Section 4, such action shall not invalidate his seat in the Council.

SEC. 4. Incumbency of one office shall not render anyone ineligible to another, save as is provided in Section 3 of this Article.

SEC. 5. The Council shall act as a governing body in every matter pertaining to the general management or policy of the Society, and shall also perform any other duties which may be prescribed by the Constitution or the By-Laws.

ARTICLE VI.

COMMITTEES.

SECTION 1. There shall be three standing Committees of the Society, known respectively as the Finance Committee, the Committee on Membership, and the Committee on Papers and Publications. Each of these Committees shall consist of three members, all of whom shall be appointed by the Council as soon after the annual meeting each year as is practicable. The Council may increase or vary the number of the Committee on Papers and Publications as conditions may demand. All members of these Committees shall serve one year beginning with the first day of January immediately following

the annual meeting, or until their successors shall have been duly chosen.

Additional Committees may be appointed at any time by the President on authority given him by the Council or the Society.

SEC. 2. It shall be the duty of the Finance Committee to audit and approve all bills before they shall be paid by the Treasurer. It shall also audit the accounts of the Treasurer at the close of his term of office, and report upon the same to the Council and the Directors, and it may at its discretion report to the Council and the Directors any plans or suggestions for improving the financial condition of the Society.

SEC. 3. The Committee on Membership shall examine into the qualifications of all applicants for membership nominated in due form, and shall report favorably to the Secretary all those whose applications it may approve, and the Secretary shall submit the names so reported to the Council for its action.

SEC. 4. The Committee on Papers and Publications, of which the Editor shall be a member and Chairman, shall have charge of all the Society's publications, and its decision shall be final with reference to the publication of any matter.

ARTICLE VII.

JOURNAL.

A Journal, published by the Society, shall be distributed to all Members and Associates not in arrears.

ARTICLE VIII.

MEETINGS.

There shall be two general meetings of the Society each year. The winter meeting shall be considered the annual meeting.

Special meetings may be appointed by the Council at its discretion.

At any meeting of the Society, twenty members shall constitute a quorum.

The time and place of each meeting shall be fixed by the Council but not more than one year in advance; and notice of the same shall be sent by the Secretary to each member of the Society at least three weeks previous to the date of said meeting.

ARTICLE IX.

LOCAL SECTIONS.

Local Sections of the Society may be established by the Council on receipt of a written request to that effect signed by twenty members of the Society, residing in the territory within which the Local Section is desired.

Such Sections shall appoint their own officers and committees, and may make any rules for their government not inconsistent with the Constitution and By-Laws of the Society. They may receive for local uses a share of their annual dues to the Society, as provided in Article X, Section I.

Each Local Section must select some place as headquarters and a definite territory to be specially benefitted by said Local Section and within which its membership must reside, both headquarters and territory to be subject to the approval of the Council. The meetings of any Local Section may be held at any place within its jurisdiction, as may be appointed. All Local Sections hereafter established must have at least twenty members of the Society in good standing.

The presiding officer of each Local Section shall be a Vice-President of the Society, *ex-officio*.

Any Local Section may be dissolved by the Council for good and sufficient reasons.

ARTICLE X.

FINANCES.

SECTION 1. Each Local Section may receive during any year from the Treasurer of the Society not more than one-third of the dues paid to the Society during that year by the members of said Local Section. The Treasurer of said Local Section shall forward to the Treasurer of the Society his application for said sum, endorsed by the presiding officer of the Section, and upon receipt of such application the Treasurer of the Society shall pay said sum to the Treasurer of said Local Section. Said sums may be used by said Local Sections only in the payment of necessary operating expenses incurred by the Section, such as printing, stationery, postage, rent and care of room, fuel, light, etc. Any excess above the necessary expenses of the Local Section for any year shall be returned to the Treasurer of the Society within two months from the close of said year, under penalty of a forfeiture of all money which would be payable to said Local Section in the year following.

SEC. 2. All funds received for life membership shall be invested as soon as possible and shall constitute a trust fund to be known as the "Life Membership Fund," which shall be held in perpetuity to guarantee the future interests of such life members. The interest of such fund not required for the above-named purposes shall be set aside as a "Research Fund," from which appropriations may be made annually by the Council, but only for the purposes of chemical research.

SEC. 3. Any Local Section may receive donations or bequests made to said Local Section, and may expend or invest the same in the interests of said Local Section at the discretion of its governing body.

SEC. 4. Any Local Section may raise or collect funds to be expended for local purposes, and may have the entire management and control of said funds in so far as said management and control shall not conflict with any provision of the Constitution or By-Laws, or with the Charter of the Society.

SEC. 5. All dues to the Society shall be collected by such officer or officers as the Council may appoint for that purpose.

SEC. 6. The Council shall determine the salaries, if any, which shall be paid to the Editor and the Secretary.

ARTICLE XI.

BY-LAWS.

The Council shall make such By-Laws not in conflict with this Constitution, as may be necessary for the proper government of the Society.

ARTICLE XII.

AMENDMENTS TO THE CONSTITUTION.

Any proposed amendment or amendments to the Constitution may be presented in writing to the Council by any five members thereof, or by at least twenty-five members of the Society.

Said amendment or amendments shall be considered by a committee of the Council, appointed by the President, which committee shall report within three months to the Council, with any suggestions it may deem best. If the report is favorable and without alterations of the original draft, the Council shall present said amendment or amendments to the Society for acceptance or rejection; if unfavorable, or if altera-

tions are suggested by the Committee, the report shall be referred by the Council back to the persons from whom the amendment or amendments were received; and if said persons still insist upon them, or upon any modification of them as reported by the committee, the Council shall then present them to the Society for acceptance or rejection in the form insisted upon by said persons, and shall also present with them any amendments which may have been suggested by the Committee and approved by the Council.

A copy of said amendment or amendments shall be sent within three weeks to each member of the Society, and each member may within thirty days thereafter send his vote to the Secretary in favor of or against said amendment or amendments. Upon the expiration of the thirty days, the Secretary, in conjunction with two other members designated by the President, shall canvass all the votes received, and shall forthwith send information of the result to each member of the Society. The assent of two-thirds of the members voting on an amendment shall be necessary to its adoption.

ARTICLE XIII.

This Constitution, when properly approved and adopted, shall take effect on the first day of January, 1898, and the Council and Board of Directors as constituted at that time shall be the governing body of the Society for the year 1898, or until its successor shall have been appointed, and shall elect two Directors designated to serve for two years, and two others to serve for one year. At the annual election in 1898, twelve Councilors shall be chosen,—four designated to serve for three years, four for two years, and four for one year.

The officers of the Society elected at the annual meeting in 1897 shall serve during 1898, with the exception of the Board of Directors as constituted by the election of 1897, which shall cease to exist as such and become a part of the Council, each member for the period of his term as Director, when the Directors are elected as provided for above.

This Article of the Constitution shall become null and void as soon as all its provisions above noted are in full effect.

Adopted December 2, 1897.

BY-LAWS.

1. At the regular meetings of the Society the order of business shall be as follows:

(*a*) Reading of minutes.

(*b*) Reports of Officers, Council, and Directors.

(*c*) Reports of committees.

(*d*) Reports of local sections in the order of their establishment.

(*e*) Reading of necrology and obituary notices.

(*f*) Appointment of necrologists.

(*g*) Reading of papers and discussions.

(*h*) Miscellaneous business.

(*i*) Report on election of officers.

(*j*) Announcements.

(*k*) Adjournment.

2. The regular order of business of the Society may be suspended at any session by the consent of three-fourths of the members present.

3. Any member of the Council may submit to that body any business which, under the provisions of the Constitution, may properly come before the Council. If the Council be not in session, the matter shall be presented in

definite form in writing, by correspondence or otherwise. All business thus submitted to the Council shall be sent to each member thereof by the Secretary, without unnecessary delay. Each Councilor may withhold his approval or disapproval of the proposed action for a period of two weeks after its reception from the Secretary, within which time the Councilors are at liberty to consult with one another on the matter under consideration, and to change their votes if already given. At the end of three weeks from the time of laying the matter before the Council, the Secretary shall transmit to the President a correct statement of the vote of the Councilors; and the President shall thereupon direct the Secretary to enter the vote on the minutes of the Council according to the expressed wish of the majority of the Councilors; provided, however, that in the case of the names of the candidates presented for election as members or associates, the vote may be announced after ten days from the date of submitting the names to the Council, if in the meantime the Secretary has received no objection to the election of said candidates.

In each and every instance in which a question may be submitted to the Council for action by correspondence, the approval of a majority of all the members of the Council shall be required for the adoption of the proposed action.

4. The President of the Society shall call a regular meeting of the Council at some convenient time in connection with each general meeting of the Society. In any regular session of the Council ten members shall constitute a quorum.

5. In order to facilitate the business of the Council, it may delegate its authority, within definite limits, to be prescribed by it, to subcommittees consisting of members of the Council residing in the same or contiguous localities, and the acts of said committees of the Council within the jurisdiction allowed to them shall be accepted as the acts of the Council itself.

6. For all meetings of the Board of Directors, whenever practicable, notice shall be given by the Secretary to the members of said Board at least one week previous to the date of said meeting, and the business which is to be presented shall be stated on the notice.

7. If any member who is already a Councilor or Director shall be elected to an office which makes him *ex-officio* a Councilor or Director, the acceptance of such office shall be considered to involve the resignation of his former position as Councilor or Director, and the position thus vacated shall be filled in the manner prescribed by the Constitution.

8. No person shall become a member of any Local Section who is not a member of the American Chemical Society; but local sections may have local associate members, who shall be entitled to all the privileges of membership in the local section, save that of voting for officers; provided that such local associate members shall not be entitled to any of the privileges of the American Chemical Society, and shall pay such local dues, of not less than two dollars ($2.00) per annum, as the Local Section may require.

9. Each Local Section shall transmit to the Secretary of the Society the names of all its officers and standing committees within three weeks of their election or appointment; and, in like manner, shall notify the Secretary of any change of officers or standing committees during the year.

10. So far as practicable each Local

Section shall report to the Secretary at least once in each year a prospectus of its plan of work, proposed meetings, etc.

11. On or before the 15th day of October in each year, each Local Section shall transmit to the Secretary its annual report to the Society. This report shall include an outline of the work done by said Local Section during the year ending August 31, a statement of the meetings held by the section, papers read, subjects discussed, etc.; also the names of all the officers and standing committees of the section at the date of the report; a statement of the number of persons belonging to said Local Section, and the net increase or decrease in its membership; also any other items of special interest.

12. All papers presented at any local section shall be considered as presented to the Society, and may, at the discretion of the Committee on Papers and Publications, be printed in the Journal of the Society. Also the proceedings of any Local Section, in so far as they may be of general interest to the Society, may, at the discretion of the Committee on Papers and Publications, be printed in the Journal.

13. All members, honorary members, or associate members of the American Chemical Society in good standing, residing in that portion of the United States set apart by the Council to be tributary to any Local Section, shall be considered members of that Local Section, and shall be so enrolled; and they shall be entitled to all the privileges such local section may, under the Constitution and these By-Laws, provide.

14. No member of a Local Section shall be enumerated for the purpose of determining the number of representatives which said section shall have in the Council of the Society who is in arrears of dues, as provided for in Section 17 of these By-Laws. The list of members in good standing of each Local Section shall be certified to the Secretary of the Society by the Secretary of said Local Section, and the Secretary of the Society shall verify the same, and notify said Local Section of the number of representatives in the Council to which said section is entitled.

15. The annual dues for members and associates shall be five dollars ($5.00) payable in advance on the first day of January in each year.

16. Any newly elected member or associate, upon the payment of the annual dues for the year in which he is elected, shall be entitled to all the publications of the Society that are distributed to its members during the year. Persons elected later than October 1 shall not be *required* to pay the annual dues for that year, but if they do pay such dues they shall receive all the publications to which members are entitled for that year.

17. Any member or associate in arrears for dues for three months shall not thereafter receive the Journal of the Society until all his arrears are paid.

18. Any person in arrears for dues for two years shall cease to be a member or associate of the Society until all his arrears are paid, when he may be reinstated as a member or associate by a majority vote of the members of the Council.

19. The Secretary shall send a written notice of their delinquency, together with a copy of the By-Laws pertaining to the subject, to all persons in arrears, at least two weeks before any further action in the matter shall be taken.

20. The Secretary shall give written notice to the Editor of all persons in arrears for three months in order that the provisions of the By-Laws regarding such cases may be carried into effect.

He shall also give similar written notice whenever such arrears are fully paid.

21. Any change in the By-Laws, or addition thereto, shall require an affirmative vote of a majority of the Council, and a written notice of the proposed change or changes shall be sent to each member of the Council at least one month previous to the announcement of the vote thereon.

Approved by the Council, April 12, 1898.

COUNCIL.

The Council has approved the territory and headquarters submitted by each of the following local sections:

Rhode Island Section.—Territory, the state of Rhode Island. Headquarters, Providence, R. I.

Chicago Section.—Territory, Chicago and suburbs. Headquarters, Chicago.

Nebraska Section.—Territory, the state of Nebraska. Headquarters, Lincoln, Neb.

Lehigh Valley Section.—Territory, that part of the Lehigh Valley included between Easton and Mauch Chunk. Headquarters, Lafayette College, Easton, Pa., and Lehigh University, South Bethlehem, Pa.

New York Section.—Territory, the territory covered by a radius of fifty miles from the New York City Hall. Headquarters, New York City.

North Carolina Section.—Territory, the state of North Carolina. Headquarters, Raleigh, N. C.

The Council has approved the headquarters selected by each of the following sections and referred back for amendment by the sections the territory selected:

Washington Section: Washington, D. C.

Cincinnati Section: Cincinnati, Ohio.

Columbus Section: Columbus, Ohio.

NAMES PROPOSED FOR MEMBERSHIP.

Beck, Herbert H., 20 S. Prince St., Lancaster, Pa.
Bragg, Miss Charlotte A., Wellesley College, Wellesley, Mass.
Collins, John A., Jr., 73 Cottage St., Fall River, Mass.
Defren, George, 449 Eighth St., So. Boston, Mass.
Dickson, W. E., care Spearman Iron Co., Sharpsville, Pa.
Drake, C. F., 4822 Lake Ave., Chicago, Ill.
Goodwin, Dr. H. M., Mass. Inst. Tech., Boston, Mass.

Hall, Wm. T., 30 Exeter St., Boston, Mass.
Hill, Herbert H., Andover, Mass.
LeClerc, J. Arthur, Agr. Expt. Sta., Geneva, N. Y.
Martin, Merrill A., Deadwood, S. D.
McTaggart, James R., Pittsburg Testing Lab., 325 S. Water St., Pittsburg, Pa.
Pierson, Willett C., Glens Falls, N. Y.
Pope, Prof. T. E., Mass. Inst. Tech., Boston, Mass.
Roberts, Dr. Charlotte Fitch, Wellesley College, Wellesley, Mass.
Trotz, J. A. Emanuel, 20 Green Lane, Worcester, Mass.

NAMES PROPOSED FOR ASSOCIATE MEMBERSHIP.

Pray, D. M., 508 Broadway, So. Boston, Mass.
Thompson, J. Howard, 372 Atlantic Ave., Boston, Mass.

NEW MEMBERS ELECTED APRIL 25, 1898.

Culman, Dr. J., P. O. Box 3092, Boston, Mass.
Durkee, Wm. C., Mass. Coll. of Pharm., Boston, Mass.
Greenwood, Harry D., Everett Mills, Lawrence, Mass.
Holman, Dr. Geo. M., Mass. Inst. Tech., Boston, Mass.
VanSlooten, Wm., 35 Wall St., N. Y. City.
White, Miss Laura B., Girls' High School, Boston, Mass.

ASSOCIATES ELECTED APRIL 25, 1898.

Clapp, E. H., 620 Atlantic Ave., Boston, Mass.
Howard, Alonzo P., 13 Pearl St., Boston, Mass.
Marble, J. Russel, Worcester, Mass.

NEW MEMBERS ELECTED MAY 17, 1898.

Babb, E. E., 61 Myrtle St., Boston, Mass.
Bartlett, Spaulding, Webster, Mass.
Bennett, Frank W., 13 Broad St., Boston, Mass.
Benson, David H., North Weymouth, Mass.
Busby, Fred. E., Mass. Inst. Tech., Boston, Mass.
Clark, Allan J., Lead, S. Dakota.
Cochrane, A. Lynde, care of Cochrane Chemical Co., Everett, Mass.
Cowen, Geo. A., 26 Adelaide St., Jamaica Plain, Mass.
Ellms, Joseph H., 1545 Blair Ave., Cincinnati, O.
Herrick, Rufus F., 22 Herrick St., Winchester, Mass.
James, G. A., Selby P. O., Contra Costa Co., Cal.
Lorenz, Henry W. F., 57 E. Columbia St., Springfield, O.
Nicholls, Geo. A., Box 926, Deadwood, S. Dakota.
Nye, W. B., Cumberland Mfg. Co., Boston, Mass.
Pratt, Gilbert H., Room 502, State House, Boston, Mass.

Pratt, Joseph H., Chapel Hill, N. C.
Pugh, Achilles H., A. H. Pugh Co., Walnut St., Cincinnati, O.
Quinan, Kenneth B., Pinole, Contra Costa Co., Cal.
Randall, N. M., Md. Steel Co., Sparrows Point, Md.
Schreiber, Fred. T., Ocala Mining Lab., Ocala, Fla.
Sylvester, John P., Harvard Chem. Lab., Cambridge, Mass.
Wakefield, Frank P., 58 Eastern Ave., Boston, Mass.
White, George R., Exeter, N. H.

ASSOCIATES ELECTED MAY 17, 1898.

Gabriel, Geo. A., 8 Melville St., Worcester, Mass.
Gagnebin, C. L., 136 Milk St., Boston, Mass.
Hobbs, Alex. F., Merrimac Print Works, Lowell, Mass.
Howe, Chester A., 92 State St., Boston, Mass.
Koch, F. C., Champaign, Ill.
Pope, W. C., Armstrong Mfg. Co., Boston, Mass.
Wolcott, J. T., 1409 W. Clark St., Urbana, Ill.

CHANGES OF ADDRESS.

Baker, Miss Dicia H., care of Presbyterian Hospital, W. 6th St., Cincinnati, O.
Chatard, Dr. T. M., 1714 Rhode Island Ave., Washington, D. C.
Cotter, John, Lieut. 15th Infantry, Fort Logan, Colo.
Dodge, F. E., 106 Madison Ave., Flushing, N. Y.
Fuller, Fred. D., 14 Elmwood Ave., Geneva, N. Y.
Hall, C. A., care Union Carbide Co., Niagara Falls, N. Y.
Haller, H. Loft, 26 Scale Lane, Hull, England.
Jessurun, David, 1406 Valmont St., New Orleans, La.
Labonde, Dr. Leon, 174 Lincoln Ave., Newark, N. J.
Ledoux, A. R., 98 John St., N. Y. City.
Lerch, Fred., Sparta, Minn.
Loveland, J. W., 184 Broadway, Cambridge, Mass.
Matheson, W. J., 182–184 Front St., N. Y. City.
Nelson, E. K., 4120 Drexel Boulevard, Chicago, Ill.
Parmelee, Howard C., Univ. of Nebr., Lincoln, Nebr.
Peek, Robert Lee, care of Ledoux & Co., 98 John St., N. Y. City.
Peters, Andrew, Hullets Landing, Lake George, N. Y.
Rhodes, Edward, Oaklands, Frodsham, Cheshire, England.
Sargent, Geo. Wm., 215 So. 5th St., Reading, Pa.
Shaw, W. T., Bozeman, Mont.
Smalley, Frank N., State Expt. Sta., Berkeley, Cal.
Smoot, Albert M., 260 W. Grant St., Elizabeth, N. J.
Steel, Fred. W., Tamunua, Navua River, Fiji.
Twining, F. E., Lock Box 693, Fresno, Cal.

ADDRESSES WANTED.

Olsson, Gustaf, formerly of Everett, Mass.

Schüpphaus, Dr. R. C., formerly care of Geo. H. Graham, 66 Broadway, N. Y. City.

Stillwell, J. S., formerly of 837–847 Broadway, N. Y. City.

MEETINGS OF THE SECTIONS.

CINCINNATI SECTION.

The April meeting was held on April 15th in the chemical lecture room of Hanna Hall, University Buildings, with seventeen members and several guests present, and President O. W. Martin in the chair.

Prof. Norton demonstrated by experiment the application of acetylene gas in the quantitative determination of copper, as recently developed by Soederbaum, and the preparation of benzene sulphonate according to the method of Gattermann, with modifications introduced in the laboratory with a view of obtaining a maximum yield.

Mr. J. O. LaBach then read an interesting paper on "The Chemistry of Foods," and exhibited several tables of nutritive values partly obtained from experiments made upon himself and some volunteering friends. In the discussion of this subject the chairman, Dr. Kramer, Prof. Norton, Dr. Springer, and Prof. Lloyd participated.

Mr. George W. Fuller, chief chemist and bacteriologist to the commissioners of water works, gave an address upon the objects and scope of the experimental investigations now in progress upon the purification of the local water supply; upon the nature of the application of chemistry in connection therewith; and upon the general analytical methods employed in these investigations.

At the next meeting, Mr. Fuller will open a discussion upon the accuracy and practical value of several of the more important methods of chemical water analysis.

Upon motion the meeting adjourned.

S. WALDBOTT, *Secretary.*

NEW YORK SECTION.

The section met in the chemical lecture room of the College

of the City of New York on Friday evening, April 15th, called to order at 8.30 P.M., Dr. Wm. McMurtrie presiding. Formal announcement was made that the section was invited to hold its next meeting at Columbia University, to be preceded by a dinner at the University restaurant.

Dr. H. C. Sherman read a note on the use of taka-diastase as a laboratory reagent. He finds it much more active than ordinary diastase, fifty milligrams converting fifty grams of starch paste in twenty minutes at 54° F.

Dr. J. H. Stebbins exhibited a small electric motor to be run by three dry cells, or the ordinary street lighting current, which he used to run stirring apparatus.

Dr. Squibb remarked that the stirring rods in such an apparatus should be inclined or have their ends shaped like propeller blades.

Dr. T. M. Chatard read a paper on the "Aurex Sluice," a new apparatus and process for the cyanide-electrolytic extraction of gold from its ores, showing charts, models, and tables of results.

The meeting adjourned at 10 P.M.

F. E. DODGE, *Secretary pro tem.*

By invitation of Dr. C. F. Chandler and the authorities of Columbia University, the regular meeting of the society was held Friday evening, May 6, at Havemeyer Hall, after a dinner in the University restaurant, at which forty-two members were present. Dr. Chandler made an address of welcome and gave a sketch of the inception and development of the Columbia School of Mines and its successor, the present "Faculty of Applied Science." The chairman then made some remarks expressing appreciation of the invitation from the university, and of the interest in the section manifested by supplying the entire program of papers, the reading of which was proceeded with as follows: 1. J. A. Mathews, "The Action of Nitrils upon Aromatic Acids." 2. E. H. Hodgson, "The Determination of Sulphur in Asphalts." 3. S. A. Tucker, "A Few Remarks on the Persulphates." 4. W. D. Engle, "The Action of Metallic Thiocyanates upon Organic Chlorhydrins." 5. A. G. Betts, "Alcoholic Ethers of Nitro-, Amido-, and Oxybenzyl Alcohol."

Mr. Hodgson had determined the sulphur in a variety of asphalts by several well-known methods, one of which was modi-

fied by the use of sodium peroxide. He found the following amounts of sulphur and differences by the several methods:

	Nitric acid. (Carius).	Sodium peroxide.	Deflagration.
Trinidad Lake	4.33	3.77	3.80
" crude	4.10	3.33	3.2
" refined	4.46	4.07	3.6
Cuban crude	3.61	3.10	2.8
Alcatraz crude	5.45	3.98	4.2
California crude	7.51	6.26	6.5

In order to have time to inspect the laboratories it was moved and seconded that the last three papers should be postponed to the next meeting, and after passing a vote of thanks to Dr. Chandler and the authorities of the university the meeting adjourned and a tour of the laboratories was made.

DURAND WOODMAN, *Secretary.*

WASHINGTON SECTION.

The regular meeting was held on April 14th.

The first paper of the evening was read by Dr. Hillebrand and was entitled "The Volumetric Estimation of Vanadium in the Presence of Small Amounts of Chromium, with Special Reference to the Analysis of Rocks and Ores." When chromium has been estimated colorimetrically, as detailed in a previous paper, the vanadium can, in many instances, be estimated without separation from the chromium by the well-known method of titration with potassium permanganate. With considerable chromium present, the error is increased by the difficulty of getting a sharp end-reaction, due to the color of the chromic salt and to the oxidizability of chromic oxide in hot solutions; but the author shows how to ascertain and apply a proper correction within certain limits.

The method is specially applicable to rocks, iron ores, clays, coals, etc., in which chromium is seldom an important constituent quantitatively.

Tables of numerous test trials on prepared solutions containing from one to 87.5 milligrams chromic oxide, and from one to forty-seven milligrams vanadium pentoxide, showed errors, with two exceptions, of much less than one-half milligram, and establish the method as trustworthy in competent hands.

A further table showed the applicability of the method to ores and rocks to which known amounts of chromic oxide and vanadium pentoxide had been added. These were fused together with sodium carbonate and nitrate, the silica and alumina were removed from the alkaline extract, phosphorus, chromium, and vanadium were thrown down by mercurous nitrate, the mixed precipitate was ignited, the residue re-fused with a little sodium carbonate, and in the resulting aqueous extract both chromium and vanadium were estimated, the results being equally as good as those obtained with simple solutions.

The author suggested that the reaction of hydrogen peroxide on chromic oxide and vanadium pentoxide in the presence of ether might be utilized to remove the greater part of the chromium prior to titration of the vanadium, since the oxidation product of chromic acid dissolves in the ether, while that of vanadic acid does not. Also that the brown color produced in vanadic solutions by hydrogen peroxide might be made the basis of an exact colorimetric method for the estimation of vanadium.

The next paper was presented by Dr. de Schweinitz and Mr. Marion Dorset, and was entitled "The Mineral Constituents of the Tubercle Bacilli." The authors, in continuation of their work upon the study of the tubercle bacilli, made a careful analysis of the ash, and found a very large percentage of phosphates, calcium, magnesium, potassium, and sodium. They pointed out the apparent close connection between the high content of fat and phosphates in the body of the germ, and the method of treating tuberculous patients with cod-liver oil and phosphates. The work is being continued now in the direction of a careful study of the albuminoids of the germ.

Mr. Fireman presented a paper on "Some Observations on the Centric Benzene Formula and the Aromatic Character." The centric formula is ascribed to the unreduced ring, while to the partially reduced ring a structure with the double bonds in the ordinary sense is attributed. The transformation of the unreduced into the reduced ring and *vice versa*, as well as the transformation of the ring with the centric structure into the ring with the double bonds and *vice versa*, must be recognized as a characteristic feature of benzene and its derivatives the aromatic compounds. If this is so, then the centric formula is inapplica-

ble to a ring of either five, seven, or any odd number of carbon atoms, reduction of such rings being impossible, since the valencies could not be satisfied in case of reduction. Hence the rings of five and seven carbon atoms, nearest to benzene in the number of members of the nucleus, cannot be expected to be endowed with an aromatic character. On the other hand, assuming as we must, that the tension in the benzene ring due to the closing of the latter, is small, then a ring of four or eight carbon atoms would similarly have too much tension, which would be incompatible with such a degree of stability as we find in aromatic compounds. It follows therefore, that from the standpoint of the centric formula and of ring-tension, only the benzene ring can be expected to be a carrier of the aromatic character, which is in entire agreement with the facts.

The last paper was presented by Dr. Stokes and was entitled "The Metaphosphimic Acids." The paper outlined an attempt to explain some of the properties of the metaphosphimic acids by means of Von Baeyer's tension theory. These acids have the general formula $(PNO_2H_2)_n$, and may be regarded as ring compounds. Regarding the rings as polygons the acids actually studied are as follows: the angle between adjacent sides of the polygon, and its difference from 135°, the angle involving the least tension being given.

	Angle between sides.	Difference from 135°.
$P_3N_3O_6H_6$	120°	−15°
$P_4N_4O_8H_8$	135°	0
$P_5N_5O_{10}H_{10}$	144°	+9°
$P_6N_6O_{12}H_{12}$	150°	+15°
$P_7N_7O_{15}H_{16}=(P_7N_7O_{14}H_{14}+H_2O)$	154.3°	+19.3°

Of these acids $P_4N_4O_8H_8$ is vastly more stable than the preceding member and represents a maximum of stability with a presumable minimum of tension. $P_5N_5O_{10}H_{10}$ is less stable than $P_4N_4O_8H_8$ but more stable than $P_3N_3O_6H_6$, while the tension in the ring of $P_7N_7O_{14}H_{14}$ is too great to permit of its existence, and it spontaneously takes up water forming $P_7N_7O_{15}H_{16}$. A further confirmation is found in the fact that the higher numbers on decomposition in part close again to form the stable ring acid $P_4N_4O_8H_8$, indicating a disposition to form rings containing P_4N_4. An attempt to test this theory further will be made by endeavor-

ing to prepare diphosphonitrilic chlorid, $P_2N_2Cl_4$. The corresponding metaphosphimic acid, $P_2N_2O_4H_4$, should have the angle 90°, differing from the angle of least tension, 135°, by —45°. Such an acid should be much less stable than even $P_7N_7O_{14}H_{14}$ and should pass at once into $P_2N_2O_5H_6$.

WILLIAM H. KRUG, *Secretary.*

Issued with July Number, 1898.

Proceedings.

COUNCIL.

The following resolution was adopted by the council June 13. Nominations to membership or associate membership shall be made in writing by three members of the society, at least one of whom shall vouch for the candidate from personal acquaintance with him and knowledge of his qualifications.

NAMES PROPOSED FOR MEMBERSHIP.

Clement, Arthur A., Wilcox Lard & Oil Co., Boston, Mass.
Coburn, D. L., 177 State St., Boston, Mass.
Cook, A. D., N. Y. Agr. Expt. Sta., Geneva, N. Y.
Crocker, Charles Stoughton, 23 Beach St., Pawtucket, R. I.
Dickson, C. J., 218 N. Jefferson St., Muncie, Ind.
Hanna, D. C., 4004 Spruce St., Philadelphia, Pa.
LeClear, Thomas, Westfield, N. J.
Godley, George McM., Sherman Square Hotel, New York City.
Johnson, George A., Court and Martin Sts., Cincinnati, Ohio.
Lockwood, Rhodes G., 118 Beacon St., Boston, Mass.
Lyman, Edmund R., Shanghai, China.
Lyng, M. N., Anaconda, Mont.
Matthews, J. M., 634 Spruce St., Philadelphia, Pa.
Moore, George D., 21 Catherine St., Worcester, Mass.
Parker, F. J., 1161 Chapel St., New Haven, Conn.
Redpath, Leon W., Cambridge, Mass.
Terry, John P., Anaconda, Mont.
Thomson, Miss Mary L., 224 W. Jersey St., Elizabeth, N. J.
Trowbridge, Miles, 135 E. 63d St., New York City.
Wilkinson, T. K., Anaconda, Mont.

NEW MEMBER ELECTED MAY 28, 1897.

Stern, Heinrich, 1338 Lexington Ave., New York City.

ASSOCIATES ELECTED MAY 28, 1898.

Barlow, W. H., Mass. Inst. Tech., Boston, Mass.
Blanchard, Arthur A., Newton Centre, Mass.
Buffington, Elisha L., 33 Chestnut St., Worcester, Mass.
Butler, W. F., 79 Tudor St., Chelsea, Mass.
Chapin, Edward S., 23 Parker St., Boston, Mass.

Cottle, George T., 13 Copley St., Roxbury, Mass.
Dixon, J. B., 32 Lawrence St., Boston, Mass.
Ellis, Carleton, 195 Winchester St., Keene, N. H.
Goodrich, Arthur L., A1 Berwick Park, Boston, Mass.
Holmes, V. F., Mass. Inst. Tech., Boston, Mass.
Kelley, Wm., Mass. Inst. Tech., Boston, Mass.
Merigold, Benjamin S., 67 Thayer Hall, Cambridge, Mass.
Mommers, Richard, 543 Massachusetts Ave., Boston, Mass.
Pierce, Frank L., 31 Milk St., Boston, Mass.
Scudder, Heyward, 29 Newbury St., Boston, Mass.
Sears, J. H., East Dennis, Mass.
Seidensticker, Lewis J., 95½ Inman St., Cambridge, Mass.
Spencer, Carl G., 259 Park Ave., Worcester, Mass.
Thrasher, Edward C., 18 Lancaster St., Worcester, Mass.
Torrey, Charles A., Jr., 44 Newbury St., Boston, Mass.
Ulmer, Geo. F., 543 Massachusetts Ave., Boston, Mass.

NEW MEMBERS ELECTED JUNE 14, 1898.

Beck, Herbert H., 20 S. Prince St., Lancaster, Pa.
Bragg, Charlotte A., Wellesley College, Wellesley, Mass.
Collins, John A., Jr., 73 Cottage St., Fall River, Mass.
Defren, George, 499 Eighth St., So. Boston, Mass.
Dickson, W. E., care Spearman Iron Co., Sharpsville, Pa.
Drake, C. F., 4822 Lake Ave., Chicago, Ill.
Goodwin, Dr. H. M., Mass. Inst. Tech., Boston, Mass.
Hall, Wm. T., 30 Exeter St., Boston, Mass.
Hill, Herbert H., Andover, Mass.
Martin, Merrill A., Deadwood, S. D.
McTaggart, James R., Pittsburg Testing Lab., 325 S. Water St., Pittsburg, Pa.
Pierson, Willett C., Glens Falls, N. Y.
Pope, Prof. T. E., Mass. Inst. Tech., Boston, Mass.
Roberts, Dr. Charlotte Fitch, Wellesley College, Wellesley, Mass.
Trotz, J. A. Emanuel, 20 Green Lane, Worcester, Mass.

ASSOCIATES ELECTED JUNE 14, 1898.

Pray, D. M., 508 Broadway, So. Boston, Mass.
Thomson, J. Howard, 372 Atlantic Ave., Boston, Mass.

CHANGES OF ADDRESS.

Case, Wm. A., 412 E. Randall St., Baltimore, Md.
Colby, Albert Ladd, care David Helms, Grove, Hamilton Co., N. Y.
Dennis, L. M., care Falck & Co., Lucerne, Switzerland.
Dortch, F. W., 909 Main St., Little Rock, Ark.

Hopkins, C. G., Urbana, Ill.
Kebler, Lyman F., 35 Poplar St., Philadelphia, Pa.
Mabery, C. F., North Gosham, Maine.
Moale, Philip R., 100 Merrimon Ave., Asheville, N. C.
Murrill, Paul, Hickory, N. C.
Peppel, S. V., 71 W. 11th Ave., Columbus, Ohio.
Seal, Alfred N., 504 11th St., N. W., Washington, D. C.
Sherman, H. C., Wesleyan Univ., Middletown, Conn.
Smith, Edward L., 10 Lowell St., Worcester, Mass.
Speyers, C. L., care Mrs. E. B. Robinson, Siasconset, Mass.
Spieler, August J., The Will & Baumer Co., Syracuse, N. Y.
Stillwell, J. S., Box 3015, New York City.
Sullivan, J. M., Corinth, Miss.
Van Gelder, Arthur P., cr Repauno Chem. Co., Chester, Pa.

MEETINGS OF THE SECTIONS.

WASHINGTON SECTION.

The 103d regular meeting of the society was held on May 12, 1898.

The first paper of the evening was presented by Messrs. F. K. Cameron and H. A. Holly and was entitled "Acetone-chloroform, 1st paper."

Acetone-chloroform is produced by bringing together acetone and chloroform, and adding powdered potassium hydroxide to the cooled mixture in small portions at a time, allowing to stand until the reaction is completed, and fractionating the liquid products. The experiments which are described by the authors have led them to the following conclusions:

I. The existence of but one acetone-chloroform, a white, crystalline solid, a derivative of trimethylcarbinol.

II. The substance is not a simple addition-product and cannot be resolved into its original constituents by direct means.

III. The substance forms no definite hydrate.

IV. The temperature of the quadruple point for solid, two solutions and vapor in the system acetone-chloroform—water, is 75.2°.

V. The melting-point is near, but above 97°, and in all probability perfectly anhydrous material has not yet been obtained.

VI. The system acetone-chloroform and water seems to present the remarkable case of a solid solution and two liquid solutions.

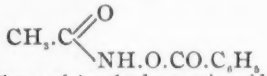
The next paper was presented by Messrs. P. Fireman and E. G. Portner and was entitled "The Action of Normal Propyl Alcohol on Phosphonium Iodid."

The authors, having undertaken to fill up some of the most important gaps in our knowledge of individual phosphins, communicated, as the first contribution, the method by which they prepared tri-*n*-propylphosphin and tetra-*n*-propylphosphonium iodide, and described the properties of these bodies.

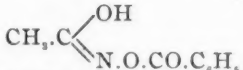
Messrs. F. K. Cameron and E. F. Thayer presented a paper on "The Boiling-point Curve for Benzene-alcohol Solutions." When a mixture of pure benzene and alcohol containing more than 66.5 per cent. of benzene is partially distilled, it will yield a distillate richer in alcohol. Complete fractional distillation will yield a mixture with a minimum constant boiling-point of 66.7° and containing 66.5 per cent. of benzene, and a residue of pure benzene. If the original solution contained less than 66.5 per cent. of benzene, it will yield a distillate richer in benzene, and complete fractioning will ultimately yield a distillate of the constant boiling solution, and a residue of pure alcohol. Under no circumstances can a complete separation of the two compounds be obtained by any process of distillation.

The last paper of the evening was presented by Mr. F. K. Cameron and was entitled "The Benzoyl Ester of Acethydroxamic Acid."

The benzoyl ester of acethydroxamic acid was obtained by Jones as a product of the reaction between sodium isonitroethane and benzoyl chloride. If ligroïn be added to the mother-liquor obtained by the crystallization of the substance from ether, another compound is precipitated, isomeric with the first. The isomer is, on standing, gradually but completely converted into the first modification. Jones regards it as a probable ester of acethydroximic acid, the relative orientations of the molecules being indicated thus:



Ester of Acethydroxamic acid.



Ester of Acethydroximic acid.

The authors have studied the two modifications, designating, for purposes of convenience, the former as the α-compound and

the latter as the β-compound, and have arrived at the following conclusions:

I. Both modifications exist in the liquid phase.

II. The α, or less fusible modification, is the stable one at ordinary temperatues.

III. Crystals of the β compound can be obtained by dissolving the α compound and precipitating the ester suddenly from solution.

IV. The equilibrium concentration changes with the temperature.

V. The α compound is converted into the β compound with absorption of heat.

VI. By raising the temperature of the system, and cooling suddenly, the point of solidification may be brought below the stable triple point. It was not possible to realize the eutectic point in this manner, because of decomposition of the substance.

VII. The eutectic point of the system was shown to be below 66°, and is near 65°.

WILLIAM H. KRUG, *Secretary.*

NORTH CAROLINA SECTION.

The annual meeting of the North Carolina Section was held in Raleigh, on February 22, 1898, with ten members present.

The following papers were read:

Chairman's address: "Minerals and Metals of the World," by F. P. Venable.

"Electrical Disturbance in Weighing," by W. A. Withers and H. K. Miller.

"Some New Mercuric Compounds," by Chas. Baskerville and Lionel Weil.

"Liquid Phosphorus," by F. P. Venable and A. W. Belden.

"Sources of Error in Health Analyses of Water," by W. A. Withers and A. W. Blair.

"Properties of Zirconia," by F. P. Venable and A. W. Belden.

"A Note on Beaker Funnels," by W. A. Withers and A. W. Blair.

"Cause of Change from Violet to Green in Chromium Salts," by F. P. Venable.

"A New Drying Bath," by F. P. Venable.

The following officers were elected for the ensuing year: F. P. Venable, Chairman; W. H. Pegram, Vice-chairman; W. A. Withers, Secretary; Chas. Baskerville, Member of the Council.

W. A. Withers was elected to represent the section at the Pure Food and Drug Congress.

W. A. Withers, Chas. Baskerville, and A. W. Blair were appointed a Committee on Membership.

It was decided to limit membership in the section to North Carolina, and to make Raleigh the headquarters of the section subject to the approval of the council.

On motion the meeting adjourned. W. A. WITHERS, *Secretary.*

Issued with August Number, 1898.

Proceedings.

COUNCIL.

COSMOS CLUB, WASHINGTON, D. C., May 12, 1898.

Prof. Charles E. Munroe, President American Chemical Society.

DEAR SIR: The committee to consider the question of exchanges with the Journal of the society, presents the following report:

The committee recommends that the exchanges named in enclosure A be discontinued; that the journals named in enclosure B be addressed to ascertain their willingness to exchange; that the exchanges named in enclosure C be continued; and that efforts be made to begin exchanges with the journals named in enclosure D. This list might be largely extended.

The committee also recommends that all exchanges should first go to the editor of the Journal and should be forwarded within four weeks to the librarian.

The committee understands that members of the society have the privilege of borrowing any volume from the library for one month on condition of defraying expenses of transportation both ways.

Some important chemical journals decline to exchange with the Journal of our society, and the question of subscribing to some of these, to perfect the library, might be taken into consideration by the proper officers.

Respectfully submitted,

H. CARRINGTON BOLTON,
EDWARD HART,
F. W. CLARKE,
EDGAR F. SMITH,
F. E. DODGE.

A. LIST OF EXCHANGES TO BE DROPPED.

Astor Library, New York, N. Y.
Chemical Review, 1424 Montana St., Chicago, Ill.
Collins, C. L., 2nd, Yale Sci. Monthly, New Haven, Conn.
Electrical Review, 23 Park Place, New York, N. Y.
Elliott Society, Charleston, S. C.
Engineers' Society Western Pa., 410 Penn. Ave., Pittsburg, Pa.
Library of Cooper Union, New York, N. Y.
Sheffield Scientific School, New Haven, Conn.
Smithsonian Institution, Washington, D. C.
Archivio di Farmacia, Via dell' Orsoline, 30–31, Rome, Italy.
Chemical Trades' Journal, 42 John Dalton St., Manchester, England.
Deutsche Gerber-Zeitung, Wilhelm Strasse, Berlin, Germany.
Henriques, Rob., Kommandantenstr. 18, Berlin, S. W., Germany.
Keeper Dept. of Minerals, British Museum Nat. Hist., Cromwell Road, London, S. W., England.
L'Engrais, 11 Rue Nicholas Leblanc, Lille, France.
Seifenfabricant, Berlin N., Germany.
Sociedad Cientifico "Antonio Alzate," cr. M. Rafael Aquilas, Mexico, Mexico.

B. EXCHANGES CONCERNING WHICH FURTHER INQUIRIES SHOULD BE MADE TO ASCERTAIN THEIR WILLINGNESS TO CONTINUE EXCHANGE.

Moniteur des Produits Chimiques, 17 Rue St. Gillis, Paris, France.
Revue des Industries Chimiques, 7 Rue St. Benoit, Paris, France.
Zeitschrift für Spiritus-Industrie, 32 Wilhelm Strasse, Berlin, Germany.

C. EXCHANGES TO BE CONTINUED.

Engineering, 35 Bedford St., Strand, London, England.
Gazetta Chimica Italiana, Via Colonna, N. 431, Palermo, Italy.
Gerber-Zeitung, Köpenicker Strasse 136, Berlin, S. O., Germany.
Ling, Arthur R., 45 Lambton Road, Wimbledon, England.
Industries and Iron, Henrietta St., Covent Garden, London, W. C., England.
Moniteur de la Teinture, 7 Rue Rochechouart, Paris, France.

Moniteur Scientifique, Quesneville, 12 Rue de Buci, Paris, France.

Oest. Ztschft. Berg. u. Hüttenwesen, Kohlmarkt 7, Vienna, Austria.

Oil and Colourman's Journal, 19–23 Ludgate Hill, London, E. C., England.

Pharmaceutical Society, 117 Bloomsbury Square, London, W. C., England.

Répertoire de Pharmacie, 117 Rue Veille-du-Temple, Paris, France.

Revue Internationale des Falsifications, Kaizersgracht 291, Amsterdam, Holland.

Royal Society of New South Wales, Sydney, Australia.

Society of Chemical Industry, care Watson Smith, 34 Upper Park Road, Haverstock Hill, London, N. W., England.

Société Chimique, 44 Rue de Rennes, Paris, France.

Société des Naturalistes, Kiev, Russia.

Société Industrielle d' Amiens, Amiens, France.

Société Industrielle de Mulhouse, Mulhouse, France.

Société Industrielle de Rouen, 24 Place de la Hauteville, Rouen, France.

Society of Arts, John St., Adelphi, London, W. C., England.

Sugar Cane, Manchester, England.

Académie des Sciences, Paris, France.

Acad. des Sciences de St Pétersbourg, Russia.

Allgemeine Oester-Chem. und Tech. Zeitung, Josefstaedter Str., Vienna, Austria.

Analyst, 59 Friends Road, Croydon, England.

Barth, Johann Ambrosius, Leipzig, Germany.

Bibliothek, D. K., Akad. d. Wissenschaften, Munich, Germany.

Chemical News, 6–7 Creed Lane, Ludgate Hill, London, England.

Chemical Society, Burlington House, Piccadilly, London, England.

Chemiker-Zeitung, Cöthen, Germany.

Chemisches Centralblatt, Gustav Adolph Str. 14, Leipzig, Germany.

Chemical and Metallurgical Society of S. A., Rand Agency, 37–38 Bettelheim Bldgs., Johannesburg, S. A. R.

Commission des Annales des Mines, Dunod. 49 Quai des Augustins, Paris, France.

Manufacturer's Review and Industrial Record, News Box 169, 103 Milk St., Boston, Mass.

N. Y. Academy of Sciences, Columbia College, New York, N. Y.

N. Y. Medical Journal, 1–5 Bond St., New York, N. Y.
Oil, Paint, and Drug Reporter, 84 William St., New York, N. Y.
School of Mines Quarterly, Columbia College, New York, N. Y.
Science, Garrison-on-Hudson, N. Y.
Scientific Library, U. S. Patent Office, Washington, D. C.
Sugar Beet, 810 Walnut St., Philadelphia, Pa.
Technology Quarterly, Mass. Inst. Tech., Boston, Mass.
Textile Colorist, 500 Arch St., Philadelphia, Pa.
Deutsch-Amerik. Apotheker-Zeitung, 104 John St., New York, N. Y.
Engineering and Mining Journal, 253 Broadway, New York, N. Y.
Franklin Institute, 15 S. 7th St., Philadelphia, Pa.
Geological Survey of Canada, Museum and Offices, Sussex St., Ottawa, Canada.
Journal of the U. S. Artillery, Fort Monroe, Va.
Journal of Physical Chemistry, Ithaca, N. Y.
Librarian of Congress, Washington, D. C.
Manufacturer and Builder, 21 Park Row, New York, N. Y.
Medico-Legal Journal, 128 Broadway, New York, N. Y.
Academy of Science, St. Louis, Mo.
American Academy of Arts and Sciences, Boston, Mass.
American Chemical Journal, P. O. Drawer 2, Baltimore, Md.
American Gas-Light Journal, 42 Pine St., New York, N. Y.
American Institute of Electrical Engineers, 26 Cortlandt St., New York, N. Y.
American Institute of Mining Engineers, P. O. Box 223, New York, N. Y.
American Journal of Pharmacy, College of Pharmacy, Philadelphia, Pa.
American Manufacturer and Iron World, 55 9th St., Pittsburg, Pa.
American Museum of Natural History, 78th St. and 8th Ave., New York, N. Y.
American Philosophical Society, 104 S. 5th St., Philadelphia, Pa.
Anthony's Photo. Bulletin, 591 Broadway, New York, N. Y.
Appleton's Popular Science Monthly, New York, N. Y.
Canadian Institute, 46 Richmond St., E. Toronto, Canada.
Academy of Natural Sciences, Logan Square, Philadelphia, Pa.
Zeitschrift für angewandte Chemie, Wilhelm Weber Str., Göttingen, Germany.

Zeitschrift für Elektrochemie, Lousbergstrasse 3, Aachen, Germany.

D. EXCHANGES TO BE ADDED IF POSSIBLE.

American Journal of Science, New Haven, Conn.
Journal für praktische Chemie, Leipzig, Germany.
Liebig's Annalen der Chemie, Leipzig, Germany.
Leipziger Färber Zeitung, Leipzig, Germany.
Annalen der Physik and Chemie (Wiedmann), Leipzig, Germany.
Monatshefte für Chemie, Wien, Austria.
Philosophical Magazine, London, England.
Dingler's Polytechnisches Journal, Stuttgart, Germany.
Zeitschrift für analytische Chemie, Wiesbaden, Germany.
Zeitschrift für anorganische Chemie, Hamburg, Germany.
Zeitschrift für physikalische Chemie, Leipzig, Germany.
Zeitschrift für physiologische Chemie, Strassburg, Germany.
[1]Zeitschrift für Untersuchung der Nahrungs-Genussmittel, Münster i. W., Germany.
Annales de Chimie et de Physique, Paris, France.
Berg. und Hüttenmännische Zeitung, Leipzig, Germany.
Akademie der Wissenschaften, Berlin, Germany.
Royal Society, London, England.
Philosophical Society, Cambridge, England.
Recueil des travaux chimiques des Pays-Bas, Leyden, Netherlands.
Annales de l' Ecole polytechnique, Delft, Netherlands.

The above report of the Committee on Exchanges has been approved, and the president, the editor, and the librarian have been appointed a committee to carry out these recommendations.

The council has directed that discretionary power be and is hereby given to the editor, upon the approval of the president in each case, to furnish authors of papers published in the Journal of the American Chemical Society such additional reprints of their papers as may be desired.

The Chemical Publishing Company has been awarded the contract to reprint 500 copies of Vol. XV, No. 2, at $1.20 per page.

[1] This Journal has requested exchange.

NAMES PROPOSED FOR MEMBERSHIP.

Burnside, Chas. F., 2020 F St., Washington, D. C.
Carpenter, Frank B., Cranshaw Warehouse, Richmond, Va.
Carr, Robert F., 145 Van Buren St., Chicago, Ill.
Doyle, Aida M., 1902 Third St., N. W., Washington, D. C.
Gronemeyer, Herman H., 731 Giddings Ave., Cleveland, O.
Hoff, Karl, 608 E. 4th St., Anaconda, Mont.
Kelley, Wm. E., 23 Van Piper Ave., Jersey City, N. J.
Macfarlane, Thomas, Lab. Inland Revenue Dept., Ottawa, Canada.
McKelvey, J. William, 813 Montgomery St., Jersey City, N. J.
Pierce, Edward W., 1529 Fairmount Ave., Philadelphia, Pa.
Smith, Albert W., Case School of Applied Science, Cleveland, O.
Smith, E. A., Montana Hotel, Anaconda, Mont.

NAMES PROPOSED FOR ASSOCIATE MEMBERSHIP.

Ames, George E., 119 Hall St., Lowell, Mass.
Dederick, Prescott K., 1 Lodge St., Albany, N. Y.

NEW MEMBERS ELECTED JUNE 25, 1898.

Barlow, W. H., Mass. Inst. Tech., Boston, Mass.
Blanchard, Arthur A., Newton Centre, Mass.
Chapin, Edward S., 23 Parker St., Boston, Mass.
Cottle, Geo. T., 13 Coplay St., Roxbury, Mass.
Dixon, J. B., 32 Lawrence St., Boston, Mass.
Goodrich, Arthur L., A 1 Berwick Park, Boston, Mass.
Kelley, Wm., Mass. Inst. Tech., Boston, Mass.
Merigold, Benjamin S., 67 Thayer Hall, Cambridge, Mass.
Mommers, Richard, 543 Massachusetts Ave., Boston, Mass.
Scudder, Heyward, 29 Newbury St., Boston, Mass.
Sears, J. H., East Dennis, Mass.
Seidensticker, Lewis J., 95½ Inman St., Cambridge, Mass.
Torrey, Chas. A., Jr., 44 Newbury St., Boston, Mass.
Ulmer, George F., 543 Massachusetts Ave., Boston, Mass.

CHANGES OF ADDRESS.

Bevier, Isabel, Plymouth, O.
Cooke, A. H., Eugenia, Ore.
Engle, W. D., Litchfield, Mich.
Fuelling, Jno. L., 6514 Kimbark Ave., Chicago, Ill.
Hall, C. A., Sault Ste Marie, Mich.
Hall, L. B., Lincoln, Loudoun Co., Va.

Hughes, R. M., Ohio State Univ., Columbus, Ohio.
Pennington, Mary E., 3908 Walnut St., Philadelphia, Pa.
Scudder, Heyward, 21 East 22d St., New York City.
Sedding, Geo. H. P., Florida Syndicate, Jacksonville, Fla.
Shepherd, Frank I., Kyle, Butler Co., O.
Sidener, C. F., Univ. of Minn., Minneapolis, Minn.
Stillwell, J. S., 18 St. Windmill St., Piccadilly Circus, London, W., England.
Venable, F. P., Charlottesville, Va.

MEETINGS OF THE SECTIONS.

CINCINNATI SECTION.

The May meeting of the Cincinnati Section took place Tuesday, May 17th, in the chemical lecture room of Hanna Hall, University Buildings, with sixteen members present, and Prof. O. W. Martin in the chair.

A communication was read by the secretary wherein the resolution adopted by the section at the January meeting regarding the outline of its territory, was referred back by the council to the section for reconsideration. A special committee was appointed, with power to act, in behalf of the section.

Mr. George W. Fuller postponed for a future occasion his paper on "Problems in Water Purification." Prof. Louis A. Bauer, of the University of Cincinnati, addressed the meeting on the subject of the "Physical and Chemical Application of the Principle of the Increase of Entropy." An abstract of this instructive address may be given as follows:

Two fundamental principles dominate the theory of heat, the principle of the conservation of energy and the principle of the increase of entropy. The definition of the latter principle was illustrated by the example of the expansion of a given volume of a gas into a vacuum, whereby the energy contents remain the same while the entropy is increased.

There are questions which the energy principle fails to answer; *e. g.*, whether heat flows of its own accord from a hotter body to a colder or vice versa. The direction in which a process can be carried out is prescribed by the second principle. The entropy principle is in fact the one which heat phenomena first obey. In the case of heat conduction, when the flow of heat has taken place in accordance with the entropy principle, then the energy principle asserts itself and says that the amount of

heat energy lost by the one body must be precisely equal to that gained by the other. The second principle determines the equilibria conditions in any physical or chemical process as far as they are dependent on heat.

Like the energy principle, the entropy principle cannot be mathematically deduced, but must be based upon a fundamental fact of experience. Entropy, like energy, is independent of the path. With the aid of this property of entropy we can express the difference between the two specific heats (constant pressure and constant volume) in terms of quantities that can be experimentally determined. This equation will furnish, therefore, an experimental test of the existence of the entropy function for any particular substance.

Various natural processes were discussed and it was shown that the total entropy invariably increased. In applying the entropy principle, care must be taken to sum up the entropy changes of all the bodies in any way concerned in the process under consideration. Other principles, such as the principle of the dissipation of energy, for example, will in certain cases determine the course a natural process will take. No principle has, however, thus far been found which admits of such universal application as the entropy principle. With no other concept of the present day can the second fundamental principle of thermodynamics and thermochemistry be so succinctly stated or so powerfully formulated. The attempts of certain physicists to replace the entropy principle by some other one, and the endeavors of some chemists to reach fundamental laws governing thermochemical phenomena without the aid of the entropy principle, have thus far proved failures.

The most general statement of the second law is: Every physical or chemical process in nature takes such a course as to increase the total entropy of all the bodies in any way concerned. In the limiting case of ideal or reversible processes, the entropy remains unchanged.

The paper concluded with physical and chemical applications of the entropy principle. Prof. Bauer finally expressed the hope that students in chemistry devote more attention to the infinitesimal calculus than has hitherto been the custom.

Upon motion the meeting adjourned.

S. WALDBOTT, *Secretary.*

NEW YORK SECTION.

The regular meeting was held June 3d, in the chemical lecture room of the College of the City of New York, at 8.15 P.M., Dr. Wm. McMurtrie presiding. The following papers were read:

F. J. Pope, "A Preliminary Note on the Titaniferous Magnetites of Eastern Ontario."

E. J. Levine, "A Comparison of Some Methods Used for the Determination of Starch."

C. H. Fulton, "The Assay of Telluride Ores."

W. S. Meyers, "Note on a Convenient Method for Maintaining Reduction of Ferrous Solutions."

C. F. McKenna, "Slag Cements."

G. L. Heath, "A Short Study of Methods for the Estimation of Sulphur in Coal."

The officers for the ensuing year were elected as follows: Dr. Wm. McMurtrie, chairman; Durand Woodman, secretary and treasurer; A. A. Breneman, A. C. Hale, C. A. Doremus, executive committee; E. E. Smith, M. T. Bogert, delegates to the scientific alliance. The elections were unanimous.

The report of the secretary showed that nine regular and two special meetings had been held at which thirty-five papers were read, with an average attendance of about fifty.

The treasurer's report was as follows:

Disbursements		$141.55
Received from society's treasurer	$105.59	
Balance due treasurer	35.96	
		$141.55
Average expense per meeting	$12.87	
" " " member	.51⅓	
Membership within the fifty-mile radius	276	

A unanimous vote of thanks was tendered Dr. Alex. S. Webb and the authorities of the College of the City of New York for all their courtesies.

The meeting was then adjourned.

DURAND WOODMAN, *Secretary.*

RHODE ISLAND SECTION.

The annual meeting of the Rhode Island Section of the American Chemical Society was held at the Hope Club House, Providence, R. I., Thursday, June 16, 1898, with Mr. Edward D. Pearce as presiding officer.

At this meeting the following persons were elected for the ensuing year: Edward D. Pearce, presiding officer; Walter

E. Smith, secretary and treasurer; Charles S. Bush, member of the executive committee.

After dinner, the presiding officer, Mr. Edward D. Pearce, presented a paper on "Some Notes on Chile Saltpetre."

WALTER E. SMITH, *Secretary.*

Issued with Septembe Number, 1898.

Proceedings.

COUNCIL.

NAMES PROPOSED FOR MEMBERSHIP.

Abel, John J., 1604 Bolton St., Baltimore, Md.
Bridge, John L., Waterbury, Conn.
Browne, Charles A., Jr., State College, Pa.
Crafts, James M., Boston, Mass.
Dow, Herbert H., Midland, Mich.
Eckley, John B., Garden City, N. Y.
Gilbert, Frederick C., 5 Warland St., Cambridgeport, Mass.
Harper, H. W., Austin, Texas.
Hawkins, H., Oakland, Bergen Co., N. J.
Henderson, Wm. E., Ohio Univ., Athens, Ohio.
Jackson, Charles L., Cambridge, Mass.
Kaufmann, W. P., Govt. Lab., Georgetown, Demerara, British Guiana.
Kremers, Edward, Univ. of Wis., Madison, Wis.
Metcalf, W. V., Northfield, Minn.
Richards, Theodore W., Harvard Univ., Cambridge, Mass.
Robertson, Benjamin Franklin, Clemson College, S. C.
Shiver, Frank Scott, Clemson College, S. C.
Smith, Frederic Jasper, Amherst, Mass.
Smith, H. Monmouth, Hampden Sydney, Va.
Smith, Horace T., East Bridgewater, Mass.
Thompson, John, A. and M. College, Greensboro, N. C.
Yeaton, Arthur C., Westbrook Sem., Deering, Me.

CHANGES OF ADDRESS.

Andrews, Geo. F., Bristol, R. I.
Austen, P. T., 346 Broadway, N. Y. City.
Baldwin, Herbert B., 906 Broad St., Newark, N. J.
Bassett, George O., 137 Pembroke St., Boston, Mass.
Bauer, Wm. C., Baker Univ., Baldwin, Kansas.
Bevier, Isabel, Plymouth, O.
Bogert, Marston Taylor, Havemeyer Hall, Columbia Univ., Boulevard and 116th St., N. Y. City.
Boyer, Chas. S., Camden, N. J.
Cameron, Frank K., Cosmos Club, Washington, D. C.
Christiansen, H. B., Rock Run, Ala.
Clarke, Thos., Chapel Hill, N. C.

Dennis, L. M., care R. Thode & Co., 39 Pragerstrasse, Dresden, Germany.
Edson, Hubert, Patterson, La.
Fay, Irving W., 544 9th St., Brooklyn, N. Y.
Grindley, H. S., 918 W. Green St., Urbana, Ill.
Hall, Lyman B., Haverford College, Haverford, Pa.
Harsh, S. A., Gould, Lewis and Clarke Co., Mont.
Hopkins, Cyril G., 907 So. Wright St., Champaign, Ill.
Jessurun, David, care Minn. Beet-Sugar Mfg. Co., St. Louis Park, Minn.
Kunze, Wm. F., Lake City, Minn.
Miller, John A., 255 Ellicott St., Buffalo, N. Y.
Miller, P. S., 96 Prospect Place, Brooklyn, N. Y.
Mitchell, Andrew S., 220 Greenbush St., Milwaukee, Wis.
Moale, Philip R., 100 Merrimon Ave., Asheville, N. C.
Neher, Fred., Princeton, N. J.
Neidich, S. A., 1041 Drexel Bldg., Philadelphia, Pa.
Newman, H. E., 2543 Moorman Ave., Cincinnati, O.
Pitman, J. R., Laflin and Rand Powder Co., Pompton Lakes, N. J.
Potter, Chas. A., 198 Waterman St., Providence, R. I.
Prentiss, G. N., care Northwestern Iron Co., Mayville, Wis.
Richards, Joseph W., Lehigh Univ., So. Bethlehem, Pa.
Riggs, L. W., Cornell University Medical College, 414 East 26th St., N. Y. City.
Schimpf, Henry W., 372 W. 35th St., N. Y. City.
Souther, Henry, Station A, Hartford, Conn.
Spencer, G. Carl, 2 Ames Place, Lowell, Mass.
Speyers, C. L., New Brunswick, N. J.
Steenken, J. G., P. O. Box 2005, N. Y. City.
Sullivan, J. M., Jackson, La.
Sy, Albert P., care Chem. Lab., Univ. of Ill., Urbana, Ill.
Thatcher, R. W., Box 113, Beatrice, Nebr.
Torrey, Chas. A., Jr., Sanbornton, N. H.
Walter, Chas. A., 517 N. Delaware St., Indianapolis, Ind.
Weston, David B., 42 Riverside St., Watertown, Mass.

Issued with October Number, 1898.

Proceedings.

MINUTES OF THE SEVENTEENTH GENERAL MEETING OF THE AMERICAN CHEMICAL SOCIETY, HELD IN BOSTON, MASS., AUGUST 22 AND 23, 1898.

The society was called to order by President Munroe at 12 M., Monday, August 22, in room 35 of the Walker Building, Massachusetts Institute of Technology.

The minutes of the general meeting held in Washington, D. C., December 29 and 30, 1897, were approved in the form in which they had already appeared in the Journal of the society.

President James M. Crafts, of the Massachusetts Institute of Technology, was introduced, and addressed a few words of welcome to the visiting chemists. President Charles E. Munroe replied in behalf of the American Chemical Society, and Vice-president Edgar F. Smith in behalf of Section C of the American Association for the Advancement of Science.

The secretary gave an informal report of the condition and progress of the society, showing a net gain in membership of 162 since the annual meeting in December, and a net gain of 535 members since December, 1894, when the society held its former meeting in Boston and Cambridge. The present membership was reported as 1318, and the number of local sections ten, the last section established being the North Eastern Section, having its headquarters in Boston and a roll of 195 members. This section was chartered March 7, 1898.

Since the last annual report was made, the secretary has received information of the death of the following named members: Ferdinand von Mueller, Australia, died October 10, 1896; S. W. McKeown, Youngstown, Ohio, died February 12, 1898; Henry C. Coon, Alfred, N. Y., died May 2, 1898; Pedro J. Sosa, Panama, Colombia, S. A., lost on the steamer "La Bourgogne," July 4, 1898.

The secretary reported the names of Henri Moissan, Sir William Crookes, and J. H. van 't Hoff duly nominated for election to honorary membership, and endorsed by the council in accordance with the requirements of the constitution. By vote of the society they were unanimously elected as honorary members.

After some announcements by the local committee and the secretary, the morning session was adjourned.

AFTERNOON.

The society was called to order at 2 P. M. Papers were read and discussed as follows:

"Petroleum Infusion in Quartz Crystals," by Charles L. Reese. Mr. Reese showed some specimens and also some drawings marking the location of the petroleum infusions. Remarks were made by Mr. Mathews.

A paper on "Catalysis" was read by J. H. Kastle, and discussed by Messrs. Cameron, W. A. Noyes, and Kastle.

"An Electric Furnace for Use with the 110-Volt Circuit," read by N. Monroe Hopkins; discussed by Messrs. Doremus and Munroe.

"Volumetric Apparatus," read by G. E. Barton.

"On the Facilities for Standardizing Chemical Apparatus Afforded by Foreign Governments and Our Own," read by Louis A. Fischer.

This paper was prepared by Mr. Fischer in accordance with a request made to Mr. Pritchett, chief of the U. S. Coast and Geodetic Survey, that such a paper be written for the meeting. Upon motion of C. B. Dudley, seconded by T. H. Norton, the thanks of the society were voted to Mr. Pritchett for acceding to the request and having the paper prepared and read by Mr. Fischer.

Upon motion of Mr. Ewell, the paper was referred to the Committee on Papers and Publications, with the recommendation that it be published in the Journal as soon as possible.

The paper was discussed by Messrs. Crafts and Caldwell, also by Mr. Ewell, who showed some pieces of standardized apparatus.

In connection with the paper, Mr. Fischer presented the following resolutions:

"*Resolved*, (1) That the liter defined by the international committee on weights be adopted.

(2) That the relative densities of all solids be referred to pure water at its maximum density.

(3) That all temperatures be referred to the hydrogen scale of the international bureau.

(4) That a convenient temperature at which volumetric apparatus shall be standardized, be adopted."

By vote of the society, these resolutions were referred to the committee on standards.

After some announcements by the president, the session was adjourned.

TUESDAY MORNING, AUGUST 23.

The society was called to order by the president, at 10.15 A. M.

A paper on "The Influence of Temperature upon the Specific Rotary Power of Sucrose," by H. W. Wiley, was read by E. E. Ewell in the absence of the author.

After some announcements by the local committee, W. A. Noyes read a paper on "The Determination of Water and Coke in Coal," prepared by W. A. Noyes and N. M. Austin. This was presented as a partial report of the committee on coal analysis, and was followed by "Notes on Determination of Water in Coal," by W. F. Hillebrand, continuing the same general subject.

These papers were discussed by Messrs. Doremus, Lord, Wm. Kent, Durand Woodman, W. A. Noyes, Hillebrand, and Munroe.

A paper on "The Progress in Utilization of City Garbage, with Special Reference to the New Plant in Boston," was read by Bruno Terne.

This was followed by a paper on "A New and Delicate Test for Nickel," by O. C. Johnson.

The following telegram was read by the secretary:

"ANN ARBOR, Mich., Aug. 20, 1898.

"*To Charles E. Munroe:* Greetings and congratulations upon growth of the society, regretting absence.

"ALBERT B. PRESCOTT."

The morning session was then adjourned.

TUESDAY AFTERNOON.

The afternoon session was called to order by President Munroe at 1.30 o'clock.

The following papers were presented :

"The Use of the Formula in Teaching Chemistry" by F. P. Venable.

"The Teaching of Organic Chemistry," by Ira Remsen.

"The Teaching of Industrial Chemistry," by Edward Hart.

"The Teaching of Analytical Chemistry," by W. L. Dudley.

After some announcements, the thanks of the society were unanimously voted to the following named persons and corporations for courtesies extended in connection with the Seventeenth General Meeting :

The North Eastern Section of the American Chemical Society.

The Corporation and Faculty of the Massachusetts Institute of Technology, and particularly President James W. Crafts.

The Corporation and Faculty of Harvard University.

The Riverside Press.

Curtis Davis & Co.

The Thayer Drug Company.

The Authorities of the Lawrence Experiment Station.

The Pacific Mills.

The Arlington Mills.

The Russell Paper Mill.

The Seventeenth General Meeting then adjourned *sine die*.

After the adjournment of the session, the members of the society were given a trolley ride through the suburbs of Boston. The start was made at 3.10 P.M. from the front of the Walker Building, and the ride lasted about three hours.

At 7 P.M. the visiting members of the American Chemical Society were given a complimentary dinner at the Algonquin Club by the members of the North Eastern Section. Dr. A. A. Noyes, chairman of the North Eastern Section, presided, and Professor Ira Remsen acted as toast-master. After-dinner speeches were made by Messrs. Munroe, Dabney, Morley, Elihu Thomson, Clarke, and Venable.

This closed the exercises devoted especially to the American Chemical Society. On Wednesday visits were made, by the

chemists, to Lawrence, to inspect the Pacific Mills, the Arlington Mills, the Russell Paper Mill, and the Lawrence Experiment Station and water works under the charge of the Massachusetts State Board of Health.

Some of the chemists joined the excursion to Salem instead of going to Lawrence.

On Thursday there were morning, afternoon, and evening sessions for reading and discussion of papers in charge of Section C., of the A. A. A. S., and Friday morning visits were madet to the Harvard University Laboratories, in Cambridge, to the Riverside Press, the Thayer Drug Co., and the Curtis Davis & Co. Soap Works. In the afternoon a session of Section C was held in Boylston Hall for the reading and discussion of papers.

The remainder of the papers were presented before Section C on Saturday.

This year the summer meeting of the society was amalgamated with that of Section C, of the A. A. A. S., after the plan adopted at the conference, in Buffalo, in 1896, and first put into operation last year in Detroit. All the papers that were offered, either for Section C or for the American Chemical Society, were put together and then classified according to topic, different topics being assigned to the different sessions during the week. The papers read on Monday and Tuesday were before the American Chemical Society, and those during the remainder of the week were read before Section C. Section C was also given time Monday morning to organize by the election of officers, and at 4.30 Monday afternoon the address of the vice-president of Section C was given before the meeting of that section.

This plan of cooperation of the two organizations has worked very much to the advantage of both, and to the union of the chemists of the country in common interests. This year the attendance was larger than ever before—222 members of the American Chemical Society alone being enrolled. There were over ninety papers presented during the week.

ALBERT C. HALE, *Secretary.*

COUNCIL.

The council of the American Chemical Society met at the Coplay Square Hotel, Boston, Mass., at 6 P.M. Monday, August

22, 1898. There were present Messrs. Munroe, Hale, Hart, McKenna, C. B. Dudley, W. L. Dudley, Caldwell, A. A. Noyes, W. A. Noyes, McMurtrie, Clarke, Norton, Doremus, and Wells.

The following named persons were elected members of the society, being nominated in due form, and recommended by the committee on membership, and their names having been published in the Journal of the society, as required by the constitution:

Burnside, Charles F., 2020 F St., Washington, D. C.
Carpenter, Frank B., Crenshaw Warehouse, Richmond, Va.
Clement, Arthur A., Wilcox Lard and Oil Co., Guttenberg, N. J.
Coburn, D. L., 177 State St., Boston, Mass.
Cook, A. D., N. Y. Agr. Expt. Station, Geneva, N. Y.
Crocker, Charles S., 23 Beach St., Pawtucket, R. I.
Dickson, J. C., 218 N. Jefferson St., Muncie, Ind.
Doyle, Miss Aida M., 1902 3rd St., N. W., Washington, D. C.
Godley, George McM., Sherman Square Hotel, N. Y. City.
Gronemeyer, Herman H., 731 Giddings Ave., Cleveland, O.
Hanna, D. C., 4004 Spruce St., Philadelphia, Pa.
Hoff, Karl, 608 E. 4th St., Anaconda, Mont.
Kelly, William E., 23 Van Riper Ave., Jersey City, N. J.
Le Cléar, Thomas, Westfield, N. J.
Le Clerc, J. Arthur, Agr. Expt. Station, Geneva, N. Y.
Lockwood, Rhodes G., 118 Beacon St., Boston, Mass.
Lyman, Edmund R., Director Chinese Technical Institute, Shanghai, China.
Lyng, N. M., Anaconda, Mont.
Macfarlane, Thomas, Lab. Inland Revenue Dept., Ottawa, Can.
Matthews, Dr. J. Merritt, 634 Spruce St., Philadelphia, Pa.
McKelvey, J. Wm., 813 Montgomery St., Jersey City, N. J.
Moore, George D., 21 Catherine St., Worcester, Mass.
Parker, Frank J., 1161 Chapel St., New Haven, Conn.
Pierce, Edward W., 1529 Fairmount Ave., Philadelphia, Pa.
Smith, Prof. Albert W., Case School of Applied Science, Cleveland, O.
Smith, E. A., Montana Hotel, Anaconda, Mont.
Terry, John P., Anaconda, Mont.
Trowbridge, Miles G., 135 E. 63rd St., N. Y. City.
Wilkinson, T. K., Anaconda, Mont.
Wilson, Herman T., Glucose Sugar Ref. Co., Peoria, Ill.
Johnson, George A., Court and Martin Sts., Cincinnati, O.

The following named were elected associates:

Ames, George E., 119 Hall St., Lowell, Mass.
Dederick, Prescott K., 1 Lodge St., Albany, N. Y.

Leon W. Redpath, Cambridge, Mass., having graduated from Harvard since he was nominated as associate, his case was referred to the committee on membership with power to decide whether he should be elected associate or member.

It was voted that all those who as students have recently been elected as associates, be and are hereby declared elected members of the society, provided they have since been graduated from chemical courses in any institution of sufficiently high order.

It was voted that all persons whose nominations to membership have been, or shall be, received in connection with the Seventeenth Meeting of the American Chemical Society be hereby passed upon by the council, and that the secretary declare them elected whenever all other requirements of the constitution shall have been fulfilled regarding them as nominees to membership.

It was voted that the council recommend to the board of directors to authorize the treasurer to have an edition of 500 copies each of the January and February numbers of the Journal for the current year reprinted by the Chemical Publishing Company, without advertisements and with printing only on the first page of the cover, at a cost not to exceed $1.10 per page for the 500 copies.

Upon motion of President Munroe, it was voted that the council recommend the board of directors to adopt the following: "Resolved that the committee on exchanges be authorized to subscribe to the journals enumerated on page 79 of our Proceedings for 1898, under the heading 'D. Exchanges to be added if possible,' when it is found that the publishers will not exchange with our Journal." It was further voted that such journals should be placed in the library of the society.

It was moved that the editor be authorized and directed to arrange with agents for the sale of the Journal outside of the United States, and he is authorized to offer such agents a commission of twenty per cent. of the subscription price of the Journal on each volume sold by them. After some discussion the question was laid on the table.

The resignation of T. B. Osborne as a member of the committee on papers and publications was read and accepted, and the secretary was directed to express to him the thanks of the council for his valuable services.

Edgar F. Smith was elected member of the committee on papers and publications, *vice* T. B. Osborne, resigned.

The treasurer made an informal report of the condition of the finances of the society, including the statement that on consultation with the finance committee and with the president of the society, he had invested $2,156.47 in the purchase of a $2,000 three and one-half per cent. bond of the City of New York. Upon motion of Mr. Hale, it was voted that the council recommend that the directors approve the action of the treasurer in making said investment.

C. B. Dudley moved that the president appoint a committee of three, of which the president shall be chairman, to consider the subject of life-membership and the creation of a fund to protect life-membership dues already paid. Adopted. In accordance with this motion, the president appointed later the following named persons to constitute said committee: Messrs. Munroe, C. B. Dudley, and McKenna.

The following communication from the secretary of the Washington Section of the American Chemical Society was read, and the territory asked for was granted by the council:

"The executive committee of the Washington Section at a special meeting held on Thursday, August 4th, modified the territory asked for, and now requests jurisdiction over the District of Columbia and all of Maryland and Virginia east of the 79th meridian."

Communications from the Cincinnati and Columbus Sections were also received and read. The council voted that it could not grant the request of the Cincinnati Section to retain, as members, certain persons residing outside of the limits of definite territory asked for, since such action would be unconstitutional. It was voted, however, that the secretary be appointed a committee with power to adjust the territorial boundaries of these sections by conferring with the representatives of the said sections. (See *Note*).

The resignation of Mr. F. E. Dodge as librarian of the society was read and accepted, and the secretary was directed to express to Mr. Dodge the thanks of the council for his faithful services.

Upon motion of Mr. Hale, Mr. Marston Taylor Bogert was elected librarian in the place of Mr. Dodge, resigned.

Upon motion of Mr. C. B. Dudley, the following was adopted:

"The council recommends the appropriation of $500 or so much thereof as may be needed to remove and set up the library in Havemeyer Hall, as per correspondence with the authorities of Columbia University, and that the librarian, the treasurer, and the chairman of the New York Section be appointed a committee with power to carry out this resolution; also that if this committee can find any other suitable location at no greater expense they be empowered to do so."

A. A. Noyes moved that a special committee be appointed by the president, consisting of the president, the editor, and five other members of the society, to make recommendation to the council in regard to an increase in the membership of the committee on papers and publications, so that it shall include special representatives of each of the important departments of chemistry. Seconded and carried.

The president made the appointments for the committee later as follows:

Charles E. Munroe, Edward Hart, A. A. Noyes, H. L. Wells, F. K. Cameron, L. P. Kinnicutt, and H. N. Stokes.

The council adjourned till 10 P.M.

At 10 P.M. the council was again called to order in the Coplay Square Hotel. Various matters of interest to the society were informally discussed, and the thanks of the council were voted to President Munroe for the dinner to the members of the council, which was provided at his expense, and was so enjoyable an occasion to all who were present.

The council then adjourned till 3.30 P.M. on the following day.

TUESDAY, AUGUST 23, 1898.

The council met pursuant to adjournment at 3.40 P.M. in the

same place as on the previous day. There were present Messrs. Munroe, Hale, Norton, W. L. Dudley, C. B. Dudley, Caldwell, A. A. Noyes, W. A. Noyes, Hart, Clarke, McMurtrie, Doremus, Wells, and Bogert.

The minutes of the meetings of the council on the previous day were read and approved.

After some informal discussion upon several matters, the council adjourned. ALBERT C. HALE, *Secretary*.

Note: The Secretary conferred with representatives of the Cincinnati and Columbus Sections who were in Boston, and the boundaries of the two sections were fixed as follows:

Each of the two sections to have the territory covered by a radius of seventy-five miles from the headquarters, except that where the territory of the two sections would overlap, the Cincinnati Section shall have a radius of fifty miles, and the Columbus Section the rest.

MEETING OF THE BOARD OF DIRECTORS, TUESDAY, AUGUST 23, 3.30 P.M.

The board was called to order by the president. There were present Messrs. Munroe, Hale, C. B. Dudley, McMurtrie, and Doremus.

The board voted the requisite appropriations and authority to carry out the recommendations of the council, made at its sessions August 22. (For items see minutes of the council.) The meeting of the directors was then adjourned.

ALBERT C. HALE, *Secretary*.

NEW MEMBERS ELECTED SEPTEMBER 16, 1898.

Carr, Robert F., 145 Van Buren St., Chicago, Ill.
Fosdick, E. H., Pinole, Contra Costa Co., Cal.
Hawkins, H., Oakland, Bergen Co., N. J.
Yeaton, Arthur C., Deering, Me.

NEW MEMBERS ELECTED SEPTEMBER 19, 1898.

Abel, John J., 1604 Bolton St., Baltimore, Md.
Bridge, John L., Waterbury, Conn.
Browne, Charles A., Jr., State College, Center Co., Pa.

Crafts, James M., Mass. Inst. Tech., Boston, Mass.
Dow, Herbert H., Midland, Mich.
Ekeley, John B., Garden City, N. Y.
Gilbert, Frederick C., 5 Warland St., Cambridgeport, Mass.
Harper, H. W., Univ. of Texas, Austin, Tex.
Jackson, Charles L., Harvard University, Cambridge, Mass.
Metcalf, W. V., Northfield, Minn.
Richards, Theodore W., Harvard Univ., Cambridge, Mass.
Robertson, Benjamin F., Clemson College, S. C.
Shiver, Frank Scott, Clemson College, S. C.
Smith, Frederic J., Amherst, Mass.
Smith, H. Monmouth, Hampden Sidney, Va.
Thompson, John, A & M. College, Greensboro, N. C.

NEW MEMBER ELECTED SEPTEMBER 21, 1898.

Kremers, Edward, Univ. of Wisconsin, Madison, Wis.

NAMES PROPOSED FOR MEMBERSHIP.

Conner, Samuel D., Nulltown, Fayette Co., Ind.
Edgerly, D. W., Mass. Inst. Tech , Boston, Mass.
Fischer Louis A., U. S. Coast and Geodetic Survey, Washington, D. C.
Jackson, George, 33 Curtis St., Cincinnati, O.
Lazell, Ellis W., N. H. College, Durham, N. H.
Schoch, Eugene P., Univ. of Texas, Austin, Texas.
Walker, Chas. A., 517 Delaware St., Indianapolis, Ind.

NAMES PROPOSED FOR ASSOCIATE MEMBERSHIP.

Haidencamp, H. W., care of John Johnson & Co., Franklin Square, N. Y. City.
Weissmann, Fred. W., 221 Molitor St., Cincinnati, O.

CHANGES OF ADDRESS.

Clapp, E. H., 35 Federal St., Boston, Mass.
Cutts, Henry E., 65 Columbia Heights, Brooklyn, N. Y.
Hero, Miss Ann, Pratt Institute, Brooklyn, N. Y.
Howard, Chas. D., Morgantown, W. Va.
Hughes, R. M., Miami Univ., Oxford, O.
Hunicke, H. Aug., 3532 Victor St., St. Louis, Mo.
Jone, Hugo, Armour Station, Chicago, Ill.
McKenzie, Box 67, Rahway, N. J.
Murrill, Paul, 711 E. Ann St., Ann Arbor, Mich.
Persons, A. A., University, Ala.

Phillips, Wm. B., 59 Ninth St., Pittsburg, Pa.
Pickel, J. M., Peekskill, N. Y.
Starke, Frederick W., 4126 Parkside Ave., W. Philadelphia, Pa.
Venable, F. P., Chapel Hill, N. C.
Wainwright, J. H., 159 Front St., N. Y. City.
Weston, Robert S., West Superior, Wis.

ADDRESS WANTED.

James, Joseph H., formerly of John Harrison Lab., Univ. of Pa., Philadelphia, Pa.

Issued with November Number, 1898.

Proceedings.

COUNCIL.

NAMES PROPOSED FOR MEMBERSHIP.

Allen, Charles M., Pratt Institute, Brooklyn, N. Y.
Aylsworth, J. W., 165 Cleveland St., Orange, N. J.
Baer, Samuel H., 158 Chambers St., N. Y. City.
Bursner, J. M., 802 Vine St., Cincinnati, Ohio.
Chittenden, R. H., Yale Univ., New Haven, Conn.
Eustis, Allan C., 346 W. 58th St., N. Y. City.
Franklin, Arthur I., Mass. Inst. Tech., Boston, Mass.
Gies, Wm. J., 346 W. 58th St., N. Y. City.
Given, Arthur, N. H. Expt. Sta., Durham, N. H.
Hill, Henry B., Harvard Univ., Cambridge, Mass.
Hodgson, Eugene H., 848 President St., Brooklyn, N. Y.
Jenkins, Ellery D., Lowell Fertilizer Co., Lowell, Mass.
Joüet, Cavalier H., Roselle, N. J.
Kelly, William E., Zeta Psi House, New Brunswick, N. J.
Lipman, Jacob G., New Brunswick, N. J.
Liska, Anton, 74 Bunker St., Chicago, Ill.
Loos, Hermann A., 119 E. 115th St., N. Y. City.
Mathewson, E. P., Guggenheim Sm. Co., Perth Amboy, N. J.
Meyer, Max, 157 W. 103d St., N. Y. City.
Miller, Frank W., Univ. of N. C., Chapel Hill, N. C.
Miller, W. Lash, Univ. of Toronto, Toronto, Canada.
Peckham, Stephen F., 1489 Pacific St., Brooklyn, N. Y.
Penfield, Samuel L., Yale Univ., New Haven, Conn.
Riederer, Emil J., 145 W. 94th St., N. Y. City.
Rosenberg, M. A., 108 E. 101st St., N. Y. City.
Scherr, Emilius Wm., Jr., 2067 7th Ave., N. Y. City.
Simmons, Ward W., 260 Union St., Brooklyn, N. Y.
Smith, Frank Marshall, Smelter P. O., Great Falls, Mont.
Somermeir, E. E., Ohio State Univ., Columbus, Ohio.
Stern, David, 112 Garfield Pl., Cincinnati, Ohio.
Sutro, H. H., 60 W. 49th St., N. Y. City.
Taylor, Sherburne F., 1283 Columbus Ave., N. Y. City.
Thomson, Milton, Ocean Ave., Newburyport, Mass.
Wells, Jas. S. C., Columbia Univ., N. Y. City.
Whitaker, Milton C., Columbia Univ., N. Y. City.

Wilson, Edwards F., Woodward, Ala.
Workman, Henry C., U. S. Patent Office, Washington, D. C.
Wyatt, Francis, 39 S. William St., N. Y. City.

NAMES PROPOSED FOR ASSOCIATE MEMBERSHIP.

Beck, Oscar C., 45 St. Marks Place, N. Y. City.
Casamajor, Walter, 372 Greene Ave., Brooklyn, N. Y.
Coffin, Edward F., 102 High St., Newburyport, Mass.
Coose, William M., 553 Boylston St., Boston, Mass.
Fisher, Henry, 108 E. 70th St., N. Y. City.
Hubbard, G. C., Tottenville, S. I., N. Y.
Imlach, William B., 309 West End Ave., N. Y. City.
Kneeland, Frederick R., 239 W. 74th St., N. Y. City.
Larkin, Charles H., Lafayette College, Easton, Pa.
Mehrbach, William, 56 E. 72d St., N. Y. City.
Pfeiffer, Clarendon H., 1 W. 81st St., N. Y. City.
Richards, Burt R., Malden, Mass.
Smith, Burnett, 144 W. 73d St., N. Y. City.
Stadermann, Albert L., 533 Betts St., Cincinnati, Ohio.
Tufts, John L., 50 Woodbine St., Roxbury, Mass.
Wright, Ralph G., 352 W. 115th St., N. Y. City.

CHANGES OF ADDRESS.

Anderson, Chas. A., Lakefield, Jackson Co., Minn.
Arnold, Fred. N., Jr., 14 Van Buren St., Dayton, Ohio.
Austen, P. T., 218 St. Johns Pl., Brooklyn, N. Y.
Beardsley, Wallace B., 266 West St., N. Y. City.
Busby, F. E., 100 Westford St., Lowell, Mass.
Colby, Albert Ladd, Long Lake, Hamilton Co., N. Y.
Doggett, C. S., Valleyfield, Quebec.
Engle, W. D., University Park, Colo.
Ewell, E. E., 1215 Twelfth St., Washington, D. C.
Fosdick, E. H., Prospect Park, Los Angeles, Cal.
Hall, Wm. T., Mass. Inst. Tech., Boston, Mass.
Koch, F. C., 312 W. Clark St., Champaign, Ill.
Lenher, Victor, Havemeyer Hall, Columbia Univ., N. Y. City.
Peters, Andrew, 291 Hancock St., Brooklyn, N. Y.
Pierson, Willett C., Univ. of Cincinnati, Cincinnati, Ohio.
de Roode, Dr. Rudolf, Care International Paper Co., 30 Broad St., N. Y. City.
Shepherd, Frank I., Univ. of Cincinnati, Cincinnati, Ohio.
Thomson, Mary J., 119 W. Grand St., Elizabeth, N. J.
Vanderpoel, Frank, 153 Center St., Orange, N. J.

MEETINGS OF THE SECTIONS.

LEHIGH VALLEY SECTION.

A meeting of the Lehigh Valley Section was held in the chemical laboratory of the Lehigh University, South Bethlehem, on Thursday evening, October 6, 1898, Dr. Joseph W. Richards presiding. The following officers were elected for the year: Presiding Officer, Joseph W. Richards; Secretary and Treasurer, Bernard Enright; Executive Committee, Porter W. Shimer, Albert Ladd Colby; Representative to the Council, Porter W. Shimer.

Owing to the absence through illness of the appointed leader, the discussion of the topical subject chosen was postponed till the next meeting.

Dr. Richards entertained the section with an account of his observations, during his recent tour in Europe, on the teachings and practice of chemistry there.

BERNARD ENRIGHT, *Secretary.*

NEW YORK SECTION.

The regular meeting of the New York Section of the American Chemical Society was held Friday evening, October 7, at the College of the City of New York, with an attendance of fifty-one members, Dr. Wm. McMurtrie presiding.

An informal report was made as to the progress in organizing a chemical club, in which it was stated that the matter is in the hands of a committee, of which Dr. C. F. Chandler is chairman, and the subject is being actively canvassed.

The question of inviting the society at large to hold the mid-winter meeting in New York was then taken up for discussion, and on final motion the vote was unanimous in favor of it, and committees of arrangements were ordered appointed.

The death of Dr. Bromwell was then announced, and a brief sketch of his career presented.

The following papers were read:

1. "An Extraction Apparatus with a Novel Accessory." By Aug. E. Knorr.

2. A Statement of the Work Accomplished at the General Meeting of the Section in Boston." By Albert C. Hale.

3. "Some Records of the Year's Progress in Applied Chemistry." By William McMurtrie.

Dr. Hale stated that the membership of the society is now 1,378; that of the section 285, and that of the recently organized New England Section is already over 200, the new members elected since September 1, numbering 60.

The next meeting of the section will be held on the 11th of November, at which it is expected that a well-known expert in the chemical technology of glass-making will be present and read a paper.

DURAND WOODMAN, *Secretary.*

Issued with December Number, 1898.

Proceedings.

COUNCIL.

The council has voted to accept the invitation of the New York Section to hold the annual meeting in New York City, and has fixed the date as December 27 and 28.

The council has ordered that the dues for membership for 1899 be collected by the secretary as in the current year, and that he be allowed ten per cent. on all collections as compensation for his work.

The council has also directed that monthly bills, presented by the secretary for clerical help during the year 1899, shall be approved by the Finance Committee and paid by the treasurer of the society, provided that the total sum called for by said bills does not exceed $600.

NAMES PROPOSED FOR MEMBERSHIP.

Aller, F. D., Maurer, N. J.
Bosart, Louis W., Jr., Home City, Hamilton Co., Ohio.
Cairns, Frederick I., 246 Park Ave., Bridgeport, Conn.
Clementson, Henry, 316 Cumberland St., Brooklyn, N. Y.
Converse, W. A., Dearborn Drug and Chem. Co., Chicago, Ill.
Duryea, Chester B., Sioux City, Iowa.
Ebersole, Morris R., Cornell Univ., Ithaca, N. Y.
Granja, Rafael, care of C. O. Mailloux, 150 Nassau St., N. Y. City.
Hirschmann, Morris, 1363 Prospect Ave., N. Y. City.
Holden, Edward F., Lake Ave., Melrose, Mass.
Klein, Otto W., 280 Broadway, N. Y. City.
Sommer, Adolph, East Cambridge, Boston, Mass.
Ward, Delancey W., 245 Sanford Ave., Flushing, N. Y.

NAMES PROPOSED FOR ASSOCIATE MEMBERSHIP.

Faulkner, Joseph G., 2529 Chatham St., Cincinnati, Ohio.
Fite, Campbell C., 1 Madison Ave., N. Y. City.
Hawkins, Clement C., 228 W. 7th St., Cincinnati, Ohio.
Masury, John W., 33 W. 71st St., N. Y. City.
Treeber, C., 372 Atlantic Ave., Boston, Mass.
White, William T., Box 45, Lowell, Mass.

NEW MEMBERS ELECTED OCTOBER 29, 1898.

Conner, Samuel D., Nulltown, Fayette Co., Ind.
Edgerly, D. W., Mass. Inst. Tech., Boston, Mass.
Fischer, Louis A., U. S. Coast and Geodetic Survey, Washington, D. C.
Henderson, William E., Athens, O.
Jackson, George, 33 Curtis St., Cincinnati, Ohio.
Kauffman, Wm. P., Gov. Lab., Georgetown, Demerara, Brit. Guiana.
Lazell, Dr. Ellis W., N. H. College, Durham, N. H.
Leon, W. Redpath, 620 Atlantic Ave., Boston, Mass.
Smith, Horace T., East Bridgewater, Mass.
Walker, Charles A., 517 Delaware St., Indianapolis, Ind.

ASSOCIATES ELECTED OCTOBER 29, 1898.

Haidencamp, H. W., care John Johnson & Co., Franklin Sq., N. Y.
Weissmann, Frederick Wm., 221 Molitor St., Cincinnati, O.

NEW MEMBERS ELECTED NOVEMBER 21, 1898.

Allen, Charles M., Pratt Institute, Brooklyn, N. Y.
Baer, Samuel H., 158 Chambers St., N. Y. City.
Chittenden, R. H., Yale Univ., New Haven, Conn.
Eustis, Allan C., 346 W. 58th St., N. Y. City.
Franklin, Arthur I., Mass. Inst. Tech., Boston, Mass.
Gies, Wm. J., 346 W. 58th St., N. Y. City.
Given, Arthur, Durham, N. H.
Hill, Henry B., Harvard Univ., Cambridge, Mass.
Hodgson, Eugene H., 848 President St., Brooklyn, N. Y.
Jenkins, Ellery D., Lowell Fertilizer Co., Lowell, Mass.
Joüet, Cavalier H., Roselle, N. J.
Kelly, William E., Zeta Psi House, New Brunswick, N. J.
Lipman, Jacob G., New Brunswick, N. J.
Liska Anton, 74 Bunker St., Chicago, Ill.
Loos, Hermann A., 119 E. 115th St., N. Y. City.
Mathewson, E. P., Guggenheim Sm. Co., Perth Amboy, N. J.
Miller, W. Lash., Univ. of Toronto, Toronto, Canad.
Peckham, Stephen F., 1489 Pacific St., Brooklyn, N. Y.
Penfield, Samuel L., Yale Univ., New Haven, Conn.
Riederer, Emil J., 145 W. 94th St., N. Y. City.
Rosenberg, M. A., 108 E. 101st St., N. Y. City.
Scherr, Emilius W., Jr., 2067 Seventh Ave., N. Y. City.
Schoch, Eugene P., Univ. of Texas, Austin, Tex.
Simmons, Ward W., 206 Union St., Brooklyn, N. Y.
Smith, Frank M., care United Sm. & Ref. Co., Smelter P. O., Great Falls, Mont.

Somermeir, E. E., Ohio State Univ., Columbus, O.
Stern, David, 112 Garfield Place, Cincinnati, O.
Sutro, H. H., 60 W. 49th St., N. Y. City.
Taylor, Sherburne F., 1283 Columbus Ave., N. Y. City.
Wells, Jas. S. C., Columbia Univ., N. Y. City.
Whitaker, Milton C., Columbia Univ., N. Y. City.
Wilson, Edwards F., Woodward, Ala.
Workman, Henry C., U. S. Patent Office, Washington, D. C.

ASSOCIATES ELECTED NOVEMBER 21, 1898.

Beck, Oscar C., 45 St. Marks Place, New York.
Casamajor, Walter, 372 Greene Ave., Brooklyn, N. Y.
Coffin, Edward F., 102 High St., Newburyport, Mass.
Corse, William M., 553 Boylston St., Boston, Mass.
Fisher, Henry, 108 E. 70th St., N. Y City.
Hubbard, G. C., Tottenville, S. I., N. Y.
Imlach, William B., 309 West End Ave., N. Y. City.
Kneeland, Frederick R., 239 W. 74th St., N. Y. City.
Larkin, Charles H., Lafayette College, Easton, Pa.
Mehrbach, William, 56 E. 72nd St., N. Y. City.
Pfeiffer, Clarendon H., 1 W. 81st St., N. Y. City.
Richards, Burt R., Malden, Mass.
Smith, Burnett, 144 W. 73rd St., N. Y. City.
Stadermann, Albert L., 533 Betts St., Cincinnati, O.
Tufts, John L., 50 Woodbine St., Roxbury, Mass.
Wright, Ralph G., 352 W. 115th St., N. Y. City.

CHANGES OF ADDRESS.

Allison, Wm. O., 100 William St., N. Y. City.
Anderson, Chas. A., Lakefield, Jackson Co., Minn.
Arnold, Fred. N., Jr., 1961 First St., Louisville, Ky.
Attix, J. C., 873 N. 24th St., Philadelphia, Pa.
Busby, Fred. E., 100 Westfield St., Lowell, Mass.
Clark, Edmund, 9 Boerum Ave., Flushing, N. Y.
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ADDRESSES WANTED.

Andrews, F. H., formerly of Bristol, R. I.

MEETINGS OF THE SECTIONS.

WASHINGTON SECTION.

The regular monthly meeting was held on October 13, 1898. The first paper of the evening was read by H. W. Wiley, and was entitled "Preliminary Report on the Vienna Congress of Applied Chemistry." Dr. Wiley gave an interesting account of the proceedings of the Third International Congress of Applied Chemistry. Some of the more important papers which were presented, were mentioned. The two most notable papers were those on the synthesis of albumen by Lilienfeld and on fermentation without cells by Buchner. The entertainments afforded to visiting congressists were also described. A full report will soon be published in the Journal of the society.

The second paper of the evening was read by H. C. Bolton, and was entitled "Chemical Bibliography." The author described in an interesting manner the methods pursued by him in the collection of bibliographic references and related some of his experiences in Europe.

Mr. Tassin called the attention of the members to a new solution for determining high specific gravities which consists of a solution of acetylene tetrabromide in benzene or toluene. It has the advantage of being stable, cheap and easily made, has a high refractive index and does not decompose with metallic oxides or metals.

WILLIAM H. KRUG, *Secretary.*

CINCINNATI SECTION.

The sixty-second regular meeting was held Saturday, October 15, 1898, in the Chemical Lecture Room of Hanna Hall, University of Cincinnati, conjointly with a meeting of the Engineers' Club, of Cincinnati.

A brief business meeting was held by the section previously in the Physical Lecture Room, President O. W. Martin in the chair. The secretary read a communication from A. C. Hale, wherein the final decision with regard to the boundary line of the territory of this section was set forth. Dr. Alfred Springer was elected by unanimous vote to represent the Cincinnati Section in the Council of the society. After the discussion of some minor matters the meeting adjourned and was resumed in the Chemical Lecture Room at 8.15 P.M., Prof. O. W. Martin, and Mr. G. W. Kittredge, president of the Engineers' Club, presiding. Twenty-six members of the section were present, and about seventy persons in all.

After some brief addresses of welcome to the engineers by the president and by Prof. Norton, Dr. Alfred Springer read, in full, the paper on "Etherion," a new gas discovered in the atmosphere by Mr. Charles F. Brush, of Cleveland, Ohio, who courteously permitted the paper to be presented at this meeting. Owing to the absence of the author, a discussion of this important paper was not in order. Both societies assembled adopted a resolution expressing a vote of thanks to Mr. Brush for having granted them the opportunity to listen to this remarkable paper.

In addition, the following papers were read: "The Chemical Training of the Engineer," by Thomas Evans; "The Chemical Problems of the Engineer," by H. B. Schmidt; "Some Engineering Anomalies," by W. B. Ruggles.

These interesting papers elicited some discussion in which Dr. Newman, Mr. Ruggles, Prof. Lloyd, and Mr. Kittredge participated.

After the adjournment of the meeting and the partaking of some light refreshments, inspection was made of the chemical, physical, and engineering laboratories of Hanna Hall.

The sixty-third regular meeting was held on Tuesday, November 15th, in the Lloyd Library, with President Martin in the

chair, and twenty-five members present. Prof. George Jackson read an exceedingly interesting paper on "The Recently Discovered Elements Neon, Metargon, Krypton, Xenon, Coronium, Polonium, and Monium." Mr. J. M. Bursner then gave a most entertaining talk on the manufacture and uses of liquidc arbonic acid, with elaborate exhibitions of apparatus, etc. In connection, Miss Wessling demonstrated the critical point for carbonic acid on a specimen contained in a sealed glass tube; the warmth of the hand was sufficient to gasify the liquid. Mr. Pilhashy finally made an informal report on the Boston meeting of the American Chemical Society.

S. WALDBOTT, *Secretary.*

NEW YORK SECTION.

The November meeting of the New York Section was held on Friday evening, the 11th, at the College of the City of New York, Dr. Wm. McMurtrie presiding and seventy members present.

The following papers were read:

(1) "A New Apparatus for the Determination of Volume," by C. F. McKenna.

(2) "Chemical Glassware," by R. M. Atwater.

(3) "The Present Status of the Periodic Law," by F. P. Venable.

A communication from the general secretary was read stating that the invitation from the section to the society at large to hold the winter meeting in New York had been accepted by the council, and the date fixed for December 27.

The chairman reported that favorable progress had been made in regard to establishing the chemical club, and it was hoped that before the expiration of the next ten days definite action would be possible towards securing the very suitable rooms which were still held for the committee's decision.

DURAND WOODMAN, *Secretary.*

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REVIEW

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ARTHUR A. NOYES, Editor.

HENRY P. TALBOT, Associate Editor.

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BIOLOGICAL CHEMISTRY	A. G. Woodman
CARBOHYDRATES	G. W. Rolfe
GENERAL CHEMISTRY	A. A. Noyes
GEOLOGICAL AND MINERALOGICAL CHEMISTRY	W. O. Crosby
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PHYSICAL CHEMISTRY	H. M. Goodwin
SANITARY CHEMISTRY	E. H. Richards
TECHNICAL CHEMISTRY	A. H. Gill and F. H. Thorp

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REVIEW OF AMERICAN CHEMICAL RESEARCH.

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ARTHUR A. NOYES, Editor; HENRY P. TALBOT, Associate Editor.
REVIEWERS: Analytical Chemistry, H. P. Talbot and W. H. Walker; Biological Chemistry, W. R. Whitney; Carbohydrates, G. W. Rolfe; General Chemistry, A. A. Noyes; Geological and Mineralogical Chemistry, W. O. Crosby; Inorganic Chemistry, Henry Fay; Metallurgical Chemistry and Assaying, H. O. Hofman; Organic Chemistry, J. F. Norris; Physical Chemistry, H. M. Goodwin; Sanitary Chemistry, E. H. Richards; Technical Chemistry, A. H. Gill and F. H. Thorp.

INORGANIC CHEMISTRY.

HENRY FAY, REVIEWER.

A New Explosive Compound Formed by the Action of Liquid Ammonia upon Iodine. BY HAMILTON P. CADY. *Kan. Univ. Quart.*, 6, 71–75.—When 25–30 cc. of liquid ammonia are added to 4–5 grams of iodine in a vacuum-jacketed tube protected from moisture, the iodine is dissolved, forming a dark, opaque liquid which changes to olive-green and deposits a dark-green, crystalline precipitate. This substance, dried over sulphuric acid, dissolves in ether, alcohol, and chloroform; but it is insoluble in dilute acids, and is decomposed by them generally with explosive violence. It is instantly decomposed by strong acids. Potassium iodide solution dissolves the crystals, and they are decomposed and dissolved by hydrogen sulphide, sulphurous acid and potassium hydroxide. The composition of the substance, as shown by analysis, agrees well with the formula HN_3I; and the formation of the compound is supposed to take place according to the equation: $11NH_3+9I=HN_3I+8NH_4I$.

Note on Extemporaneous Chlorine Water. BY F. B. POWER. *Pharm. Rev.*, 15, 108.—The author criticises the statement made by Griggi that chlorine can be prepared according to the equation

$$2H_2C_2O_4+PbO_2+CaCl_2=CaC_2O_4+PbC_2O_4+2H_2O+Cl_2.$$

It was shown that what was taken for chlorine was probably ozone; and that while the oxalic acid was mostly oxidized to carbon dioxide, practically all of the calcium chloride was unacted upon.

The Action of Carbon Dioxide upon Sodium Aluminate and the Formation of Basic Aluminium Carbonate. BY WILLIAM

C. DAY. *Am. Chem. J.*, **19**, 707–728.—The author has analyzed a series of preparations made by precipitating sodium aluminate by carbon dioxide. The sodium aluminate was prepared from Connetable phosphate rock, by treating it with sodium carbonate and quicklime, which leaves all iron compounds and calcium phosphate undissolved. Before working with the samples prepared, a commercial product, "Alumina soluble in acids," was analyzed, and found to contain 26.38 per cent. CO_2, and 21.30 per cent. Na_2O. Some of the original substance was then washed with water until no alkali could be detected by litmus or phenol-phthalein. The dried residue from the washing effervesced with acid, and gave on analysis 17.35 per cent. CO_2, and 12.22 per cent. Na_2O, amounts corresponding closely to that required for sodium bicarbonate. Several preparations were then made and washed with hot water until apparently free from alkali; they were then dried on the water-bath and analyzed; but it was found that all portions contained sodium oxide and carbon dioxide. This dried sample showed alkali on washing, and continued to show it after apparently washed free from it a second time. Preparations washed with cold water by decantation until apparently free from alkali always showed it on analysis, but gave off more after drying and washing again. In two samples it was possible to wash the sodium out until only 0.24 and 0.34 per cent. remained; and in the same preparations there was left respectively 9.06 and 3.99 per cent. of carbon dioxide, which is more than that needed for the formation of sodium bicarbonate, indicating that a basic aluminum carbonate of varying composition might exist.

On the Chloronitrides of Phosphorus. (II). BY H. N. STOKES. *Am. Chem. J.*, **19**, 782–796.—In a previous paper (this *Rev.*, **3**, 4), the author described the phosphonitrilic chlorides having the composition $P_3N_3Cl_6$ and $P_4N_4Cl_8$, and their corresponding acids. This paper is a continuation of the work describing the polymers of the same series. The following table shows the additional members which have been isolated, together with their properties:

	Melting-point.	Boiling-point. 13 mm.	Boiling-point. 760 mm.
Triphosphonitrilic chloride, $(PNCl_2)_3$	114°	127°	256.5°
Tetraphosphonitrilic chloride, $(PNCl_2)_4$	123.5°	188°	328.5°
Pentaphosphonitrilic chloride, $(PNCl_2)_5$	40.5–41°	233–224.3°	Polymerizes
Hexaphosphonitrilic chloride, $(PNCl_2)_6$	91°	261–263°	Polymerizes
Heptaphosphonitrilic chloride, $(PNCl_2)_7$	liquid at −18°	289–294°	Polymerizes
Polyphosphonitrilic chloride, $(PNCl_2)_x$	Below red heat.	Depolymerizes on distillation.	

There was also obtained a liquid residue of the same empirical composition of a *mean* molecular weight corresponding nearly to $(PNCl_2)_{11}$; but it has not yet been prepared in a pure condition. The method that gives the best results in the preparation of these compounds is to heat a mixture of four parts of dry phosphorus pentachloride with one part of ammonium chloride. As the mixture liberates hydrochloric acid, it is necessary to open the tube occasionally to relieve the pressure; and this is best accomplished by heating to 150° C., allowing to cool to 100°., and opening the tubes while in the furnace. This process is repeated several times, each time heating 1°–2° higher. After most of the hydrochloric acid has been removed in this way, the tube can be safely heated to 200° C. The contents of the tube are then distilled off, and the distillate is found to consist of a crystalline mass impregnated with a yellow oil, amounting to 95 per cent. of the theoretical quantity of phosphonitrilic chlorides, of a small amount of phosphorus pentachloride, of some chloronitride of the composition $P_6N_7Cl_9$, and of traces of an unknown compound. The melted distillate is poured into cold water to remove phosphorus pentachloride; and it is then heated for about two hours. The product is then fractionated up to 200° C. at 13–15 mm., using an Anschütz flask. The distillate at this temperature consists of about 70 per cent. $P_3N_3Cl_6$ and $P_4N_4Cl_8$; the residue of $P_5N_5Cl_{10}$ and the higher members. If the distillate is not desired, it is best to take advantage of the peculiar properties of the substance and polymerize it to the compound $(PNCl_2)_x$ which can in turn be depolymerized, giving the different lower members of the series. The residue of $P_5N_5Cl_{10}$ and higher members is fractionated above 200° C. Polymerization often takes place during the heating, as is indicated by the frothing; but this may be overcome by heating with water and removing the small amount of oil formed, and again continuing the fractionation. It has not been found advisable to heat above 370°, as polymerization takes place rapidly at that temperature. Pentaphosphonitrilic chloride at its melting-point is soluble in all proportions of benzene, ether, carbon bisulphide, and gasoline; but it cannot be crystallized from any of them. It shows a decided tendency to superfusion. The next two members of the series are soluble in benzene, ether, carbon bisulphide and gasoline; hexaphosphonitrilic chloride possessing a strong crystallizing power. When any of the lower members are heated polyphosphonitrilic chloride is formed slowly at 250° C., and rapidly at 350° C. As the change is reversible, complete transformation cannot be effected; but it reaches 90 per cent. The pure chloride is colorless, transparent, and elastic; it is insoluble in all neutral solvents; but it readily absorbs ben-

zene, swelling to a rubber-like compound of many times its own volume. Hot water slowly dissolves it with decomposition; it swells, gelatinizes, and finally dissolves in ammonia. Depolymerization begins at 350° C., and this change is rapid below a red heat.

On the Solubility of Ammonia in Water at Temperatures below 0°. By J. W. MALLET. *Am. Chem. J.*, **19**, 804–809.—The author has extended the determination of the solubility of ammonia made by Roscoe and Ditmar from 0° to —40° C. Strong aqueous ammonia was placed in a burette-like tube surrounded by a freezing mixture, and gaseous ammonia, previously cooled by being passed through tubes placed in freezing mixtures, was passed into the already strong solution. The temperature was recorded by means of a standardized alcohol thermometer. Measured portions were drawn off, beginning at —40° C. at intervals of 10° into water cooled to 0° and titrated with sulphuric acid. The solution of enough ammonia to form ammonium hydroxide was not attended with any apparent change of behavior; and continuous liquefaction went on smoothly to the lowest temperature reached, without separation of any solid product. The table expresses the amount of ammonia dissolved in one gram of water at a pressure of 743–744.4 mm.:

°C.	Grams.	°C.	Grams.
—3.9	0.947	—25	2.554
—10	1.115	—30	2.781
—20	1.768	—40	2.946

The amount dissolved at —3.9° C. corresponds almost exacty to that calculated for ammonium hydroxide.

The Action of Nitric Acid on Aluminum and the Formation of Aluminum Nitrate. By THOMAS B. STILLMAN. *J. Am. Chem. Soc.*, **19**, 711–717.—The author shows that aluminum in the form of coarse turnings is readily acted upon by nitric acid, hot or cold, of specific gravity 1.15 or 1.45, the weaker acid acting the more rapidly. The reaction is retarded if the aluminum is in the form of plates, the retardation being very slight with cold acid, but considerable if the acid is warm. The solutions deposited crystals of the composition $Al(NO_3)_3.9H_2O$.

Notes on Selenium and Tellurium. By EDWARD KELLER. *J. Am. Chem. Soc.*, **19**, 771–778.—It is shown that ferric hydroxide carries down both selenium and tellurium, the amount needed for the precipitation of the former element being much greater than for the latter. To obtain both elements quantitatively in precipitating from hydrochloric acid solutions, it is necessary to

have the acidity of the solution between definite limits, 30–50 per cent. Figures are given for the partial precipitation of both elements, showing that the amount of precipitate varies with the time, temperature, and the acidity of the solutions. There is complete precipitation of tellurium when the solution contains 0.5 per cent. acid, but then none of the selenium is precipitated. When the acidity has reached 80 per cent., all of the selenium, but no tellurium, is precipitated. The reducing action of ferrous sulphate is almost identical with that of sulphurous acid. In precipitating copper solutions containing selenium with hydrogen sulphide, some of the latter is always carried down, probably in combination with copper as selenide.

Further Study on the Influence of Heat Treatment and Carbon upon the Solubility of Phosphorus in Steel. By E. D. Campbell and S. C. Babcock. *J. Am. Chem. Soc.*, 19, 786–790.—This is a continuation of a previous paper (this *Rev.*, 3, 2) greater care having been taken here to measure temperatures by means of a Le Chatelier pyrometer. The general results reached are: that phosphorus may exist in at least two forms in steel; that carbon and the different heat treatment, annealing and quenching, considerably affect the solubility of the phosphorus in acid mercuric chloride solution, the amount going into solution apparently increasing with increase of the temperature at which the metal is quenched, and also with the percentage of carbon.

Contribution to the Chemistry of Didymium. By L. M. Dennis and E. M. Chamot. *J. Am. Chem. Soc.*, 19, 799–809 —The mixture of earths used in this work was extracted from monazite sand from Brazil. The sand was decomposed by sulphuric acid, and the rare earths separated from the other elements in the usual way. Cerium was separated from the didymium group by the chlorine process in apparatus specially devised for the purpose. The oxalates were then decomposed by heat and converted into nitrates, their solution being treated with an excess of potassium sulphate for the purpose of removing the yttrium group. The double sulphates were then dissolved in dilute ammonium acetate, converted into the hydroxides and then into nitrates. Fractionation of the double ammonium nitrates by the methods of Welsbach and Bettendorf did not yield satisfactory results; and it was found that the best results were obtained by slow spontaneous evaporation. In this way there was more rapid separation of neodidymium from praseodidymium. A large portion of lanthanum salts was separated in the first fractions, disappearing for a time, and

again appearing in later fractions. It was found that the presence of the lanthanum salts aided much in the splitting of the two constituents of didymium. Detailed directions are given for the method giving the most satisfactory results.

A Study of the Mixed Halides and Halo-Thiocyanates of Lead. By CHARLES H. HERTY AND J. R. BOGGS. *J. Am. Chem. Soc.*, **19**, 820–824.—Lead chloride and lead bromide form isomorphous mixtures in all proportions, while lead iodide with lead chloride or bromide forms mixed crystals with the latter in excess. Lead thiocyanate forms true compounds with both lead chloride and lead bromide, but with lead iodide forms neither mixed crystals nor a chemical compound.

On the Existence of Orthosilicic Acid. By T. H. NORTON AND D. M. ROTH. *J. Am. Chem. Soc.*, **19**, 832–834.—Silicic acid obtained by passing silicon tetrafluoride into water, was thrown on a cloth filter, washed quickly with ether or benzene, dried by pressure between folds of filter paper, and analyzed. The results obtained agree well with the formula H_4SiO_4. The substance thus obtained readily loses water.

The Solubility of Stannous Iodide in Water and in Solutions of Hydriodic Acid. By S. W. YOUNG. *J. Am. Chem. Soc.*, **19**, 845–851.—Portions of saturated solutions of stannous iodide in water and in hydriodic acid protected from the air by a layer of oil, were drawn off at different temperatures, weighed and titrated with iodine solution. The results are normal with water, but the solubility in hydriodic acid decreases until the solution contains 6–7 per cent. of acid, and thereafter increases. When the concentration has reached 25 per cent. of hydriodic acid there is a marked increase in the solubility with decreasing temperature (see next abstract). Tables and curves are given expressing the solubility values.

On Iodostannous Acid. By S. W. YOUNG. *J. Am. Chem. Soc.*, **19**, 851–859.—When the solution of stannous iodide in hydriodic acid, containing 25 per cent. acid, is cooled in ice water, light yellow needles crystallize out. Unsuccessful attempts were made to dry these crystals in hydrogen and in hydriodic acid at different temperatures, but decomposition always resulted. Their composition was established indirectly by analyzing for total stannous iodide, iodine, and free hydriodic acid, before and after cooling to separate the crystals. The difference in the amounts found represented what had left the solution to form the crystals, which were found to have the composition represented by the formula $SnI_2.HI$.

On the Reactions between Mercury and Concentrated Sulphuric Acid. By CHARLES BASKERVILLE AND F. W. MILLER. *J. Am. Chem. Soc.*, **19**, 873–877.—When mercury is in excess almost pure mercurous sulphate and sulphur dioxide are formed, with no evidence of hydrogen as hydrogen sulphide; but when the sulphuric acid is in excess, there is formed at 150° a compound having the composition $Hg_2SO_4.HgSO_4$. With increasing temperature there was corresponding decrease in the amount of mercurous sulphate formed. This method for preparing sulphur dioxide is not convenient on account of the volatility of mercury.

ORGANIC CHEMISTRY.

J. F. NORRIS, REVIEWER.

1. On the Oximes of Mucophenoxychloric and Mucophenoxybromic Acids. By HENRY B. HILL AND JOHN A. WIDTSOE. **2. On the Action of Aluminic Chloride and Benzol upon Mucochloryl Chloride, Mucobromyl Bromide, and the Corresponding Acids.** By HENRY B. HILL AND FREDERICK L. DUNLAP. *Am. Chem. J.*, **19**, 627–650.—Hill and Cornelison (*Am. Chem. J.*, **16**, 188, 277) found that mucochloric and mucobromic acids yielded with hydroxylamine oximes of normal character, while the bromanhydrides of these acids could easily be converted by reduction into the corresponding substituted crotonolactones. The former reaction indicated the presence of an aldehyde group, while the latter was evidence of a different structure. The two views are expressed by the following formulæ:

$$\begin{matrix} ClC.CHO \\ \| \\ ClC.COOH \end{matrix} \quad (1) \qquad \begin{matrix} ClC.CH.OH \\ \| \quad >O \\ ClCCO \end{matrix} \quad (2)$$

The action of hydroxylamine on the methyl esters of mucochloric and mucobromic acids was studied in order to see if they, too, exhibited tautomerism. They did not form an oxime and accordingly were derivatives of formula (2). The present paper contains the results of a similar investigation of mucophenoxybromic and mucophenoxychloric acids and their esters. The methyl esters readily gave oximes identical with those prepared by the action of methyl iodide on the silver salts of the oximes of the acids. The marked difference in behavior which was shown by mucochloric and mucobromic acids and their esters disappears as soon as one atom of halogen is replaced by the phenoxy group. No explanation of this is offered. In the course of the investigation the following compounds were pre-

pared and are described fully: the silver salt and methyl and ethyl esters of mucophenoxybromoxime, methylmucophenoxybromate, mucophenoxybromoxime anhydride, phenoxybrommaleïnimide and its silver salt, and the corresponding derivatives of mucophenoxychloric acid.

2. The conversion of mucochloric and mucobromic acids, through their bromanhydrides, into substituted crotonolactones, finds its simplest explanation in the assumption that these acids themselves are oxylactones (formula 2). This conclusion has been reached by the study of a reaction of an entirely different character. The two possible structures for the chloranhydrides of mucochloric acid are:

$$\begin{matrix} ClC.CHO \\ \| \\ ClC.COCl \end{matrix} \qquad \text{and} \qquad \begin{matrix} ClC.CHCl \\ \| \quad >O. \\ ClC.CO \end{matrix}$$

The first should give an aldehyde ketone while the second should yield dichlordiphenylcrotonic acid when treated with benzene and aluminum chloride. Both the acid and its chloranhydride when so treated gave dichlordiphenylcrotonic acid. With mucobromic acid the analogous acid containing bromine was formed. The structure of the latter was determined by conversion through oxidation into diphenylacetic acid. The following substances are described: mucochloryl chloride; dichlordiphenylcrotonic acid and its barium and calcium salts; diphenhylbutyric acid, formed by the reduction of diphenyldichlorcrotonic acid, and its silver salt; dibromdiphenylcrotonic acid, its barium, calcium, and silver salts, and methyl ester; and diphenylbromallylene dibromide, formed by the action of bromine on the product resulting from the decomposition of dibromdiphenylcrotonic acid in alkaline solution.

On the Absorption of Oxygen by Tetrabromfurfuran. By Henry A. Torrey. *Am. Chem. J.*, **19**, 668–672.—Hill and Hartshorn (*Ber. d. chem. Ges.*, **18**, 448) found that α-dibromfurfuran was readily oxidized to maleïc acid upon exposure to the air, but that tetrabromfurfuran, which also contains two bromine atoms in the α-position, under ordinary conditions, was not affected. It has lately been discovered that exposure to direct sunlight causes a similar decomposition of tetrabromfurfuran. This change is most readily effected when the substance is exposed to strong sunlight in an atmosphere of dry oxygen. In 7 or 8 hours the increase in weight is equivalent to about 85 per cent. of one molecular weight of oxygen. The main product was shown to be dibrommaleyl bromide.

On Certain Derivatives of Brommaleic and Chlormaleic Acid-Aldehydes. By Henry B. Hill and Eugene T. Allen. *Am. Chem. J.*, **19**, 650–667.—Limpricht (*Ann. Chem.*, **165**, 287) obtained with great difficulty, by the action of aqueous bromine upon pyromucic acid, a compound which he considered to be the half aldehyde of fumaric acid, as it yielded the latter when oxidized with silver oxide. Since the authors were unable to isolate the compound from the viscous reaction-product, it was treated with hydroxylamine hydrochlorate and an aldoxime was obtained in small quantity, which contained bromine. By using pyromucic acid and bromine in the molecular proportions of one to three the yield of the oxime was greatly increased. From the brommaleïc acid-aldoxime so prepared the barium, lead, and silver salts and methyl ester were formed. The anhydride was made by the action of concentrated hydrochloric acid and by dissolving the oxime in concentrated sulphuric acid and precipitating with water. In the same way the anhydrides of mucochlor- and mucobromoxime were prepared. Brommaleïnimide could not be formed by heating directly the brommaleïc acid-aldoxime, but was obtained in small yield by sublimation from the carbonaceous residue left when the anhydride was cautiously heated. Hydrobromic acid reacts with brommaleïc acid-aldoxime forming brommaleïc acid, or, on long standing, dibromsuccinic acid. By dissolving the oxime in a mixture of acetic acid and acetic anhydride and saturating with hydrochloric acid gas, bromchlorsuccinic acid was obtained. By the action of hydrochloric acid, hydrobromic acid, and bromine on the methyl ester of brommaleïc acid-aldoxime direct addition-products were formed. Tribromsuccinic acid-aldoxime was changed into dibromacroleïnoxime by warming with water at 40°. It was impossible to isolate dibromacroleïn from its oxime, but by boiling the latter with dilute hydrochloric acid a solution was obtained, which showed the reactions of aldehydes and from which an α-β-dibromacrylic acid was obtained in small yield by oxidizing with silver oxide. As the substituted acrylic acid did not melt at the melting-point of dibromacrylic acid obtained from tribromsuccinic acid, it was probably an isomer of it. Chlormaleïc acid-aldoxime was prepared by the action of chlorine on pyromucic acid and was studied in the same way that the corresponding bromine compound was.

Derivatives of Eugenol. By F. J. Pond and F. T. Beers. *J. Am. Chem. Soc.*, **19**, 825–832.—Benzyl eugenol, prepared by the action of benzyl chloride on the sodium salt of eugenol, was transformed into its isomer isobenzyl eugenol,

$$CH_3O.C_6H_3\begin{cases}OCH_2{=}C_6H_5\\ CH{=}CH.CH_3,\end{cases}$$

by boiling with alcoholic potassium hydroxide. This yielded a dibrom addition-product, which was converted by sodium methylate into the ketone $CH_3.C_6H_3\langle^{OCH_2.C_6H_5}_{CO.CH_2.CH_3}$. The oxime of the latter was also prepared.

Derivatives of Benzenesulphonic Acid. By T. H. Norton. *J. Am. Chem. Soc.*, **19**, 835–838.—A detailed description is given of the preparation and properties of benzenesulphonbromide and the sodium, potassium, ammonium, and lithium salts of benzenesulphonic acid.

On a Soluble Compound of Hydrastine with Monocalcium Phosphate. By T. H. Norton and H. E. Newman. *J. Am. Chem. Soc.*, **19**, 838–840.—A large excess of hydrastine was agitated with a saturated solution of monocalcium phosphate. At the end of 80 hours the solution was filtered and evaporated to dryness, when an amorphous residue was left, which was soluble in about ten parts of water. The analyses corresponded to the formula $2Ca(H_2PO_4)_2.3C_{21}H_{21}NO_6$.

Aliphatic Sulphonic Acids. By Elmer P. Kohler. *Am. Chem. J.*, **19**, 728–752.—The work described is the result of an effort to find general methods for the preparation of unsaturated aliphatic sulphonic acids, and particularly of isomeric sulphonic acids analogous to fumaric and maleïc acids. A large number of sulphonic acids were studied with reference to their behavior with phosphorus pentachloride and the behavior of the resulting chlorides toward water. As it was found that the main product of the action of water on the chloride of a (1, 2)-disulphonic acid was an unsaturated acid, (1, 2)-ethanedisulphonic acid was carefully studied. The work now published is the result of this part of the investigation. Sodium ethanedisulphonate was prepared by boiling ethylene bromide with a saturated solution of sodium sulphite. The author's method gives 95 per cent. of the theoretical yield. From this a nearly quantitative yield of the chloride was obtained by the action of phosphorus pentachloride. As it melted sharply, the possibility of the formation of isomers was excluded. From the close analogy of (1, 2)-ethanedisulphonic acid, succinic acid, and orthosulphobenzoic acid, it seemed probable that the former, like the latter, would yield both a symmetrical and an unsymmetrical chloride. But one, however, was obtained, although the conditions under which it was prepared were varied. As the same compound was also formed by the action of carbonyl chloride on ethanedisulphonic acid, it has probably the symmetrical structure $(CH_2SO_2Cl)_2$. The chloride reacts with water very slowly at 0°. At 100° it de-

composes rapidly, forming sulphur dioxide, hydrochloric acid, and ethylenesulphonic acid, according to the following equation: $(CH_2SO_2Cl)_2+H_2O=CH_2=CH.SO_3H+SO_2+2HCl$. The yield of unsaturated acid is about 90 per cent. of the theory. A small amount of ethanedisulphonic acid is formed at the same time. Alcohols produce a similar decomposition, the yield of unsaturated acid decreasing as the number of carbon atoms in the alcohol increase; *e. g.*, methyl, propyl, and amyl alcohols, give 73, 56, and 51 per cent. respectively. Ammonia does not give an amide, but ammonium chloride, ammonium sulphite, ammonium ethanedisulphonate, and anhydrotaurine. With aniline anhydrophenyltaurine, $\begin{matrix}CH_2\\ |\\ CH_2SO_2\end{matrix}\!\!>\!N.C_6H_5$, and the hydrochlorate of anilidoethanesulphone anilide, $\begin{matrix}CH_2NHC_6H_5.HCl\\ |\\ CH_2SO_2NHC_6H_5\end{matrix}$, were obtained. From the latter the free base was isolated, and from this the monoacetyl derivative was made, which had the structure $\begin{matrix}CH_3CO\\ \\ C_6H_5\end{matrix}\!\!>\!N.CH_2CH_2SO_2NHC_6H_5$, as it was soluble in alkali. Since the amide of ethanedisulphonic acid could not be prepared by the usual reactions, an effort was made to get it by the action of acetamide on the chloride. The reaction did not take place in the manner expected. The hydrochlorate of acetamide, ammonium ethanedisulphonate, and ammonium chlorethanesulphonate were obtained. The chloride, dissolved in glacial acetic acid, was decomposed by sodium acetate, the products being, as before, ethylene sulphonic acid and ethane disulphonic acid. With zinc dust a 53 per cent. yield of (1, 2)-ethanedisulphinic acid was obtained. As a result of the work the conclusion is drawn that the best way to prepare unsaturated aliphatic sulphonic acids is to decompose with water the chlorides of polysulphonic acids, which have the sulphonic acid residues in the (1, 2)-positions with respect to each other.

Some New Derivatives of Diacetyl. By Harry F. Keller and Philip Maas. *J. Franklin Inst.*, **144**, 379–385.—As hydrogen peroxide converts diacetyl quantitatively into acetic acid, its action was studied on dibrom and tetrabromdiacetyl in order to determine their structure. If the oxidizing agent acts in the same way with these substances and they have symmetrical structures, the first would give two molecules of bromacetic acid and the second two molecules of dibromacetic acid. Bromacetic acid was obtained from the former, but the latter yielded penta-

bromacetone. Diacetyl and hydrocyanic acid unite quantitatively to form a dicyanohydrin, which is readily converted into dimethylracemic acid. Attemps to prepare a monocyanohydrin of diacetyl were unsuccessful, however. When diacetyl and hydrocyanic acid were brought together in molecular proportions, there was evidence of a reaction, but no compound could be isolated. The resulting viscous liquid was treated with hydrochloric acid under different conditions, in order to saponify it, but no acid was obtained. Dibromdiacetyl and hydrocyanic acid united, forming a dicyanohydrin. Dichlordiacetyl was prepared by the action of chlorine on diacetyl dissolved in chloroform.

On Diacyl Anilides. By H. L. Wheeler, T. E. Smith and C. H. Warren. *Am. Chem. J.*, **19**, 757–766. The fact that formanilide differs in many of its physical properties from other anilides has been offered as evidence that it is not a true anilide, and consequently does not contain the formyl group $-C\overset{O}{\diagdown\!\!\diagup}H$. As the formyl group is present in the diacyl anilides, a crystallographic study was made of formylbenzenesulphanilide and its homologues containing the acetyl and propionyl groups in order to discover if any marked differences in physical structure existed. It was found that the anilides containing acetyl and propionyl show close crystallographic analogy, both being monoclinic, hemimorphic, and pyroelectric, their axes and the angle β being similar, whereas, formylbenzenesulphanilide is orthorhombic. It follows, therefore, that the departure in physical properties of formanilide from those of its homologues can not be taken as evidence against its being a true anilide. In addition to the compounds mentioned, the following are described: *n*-butyrylbenzenesulphanilide, benzoylbenzenesulphanilide, benzoylbenzenesulph-α-(and β)-naphthalide. The crystallography of benzoylbenzenesulphanilide and formanilide is also given. The latter crystallizes in the monoclinic system, whereas acetanilide is orthorhombic.

Note on a Somewhat Remarkable Case of the Rapid Polymerization of Chloral. By J. W. Mallet. *Am. Chem. J.*, **19**, 809–810.—A sample of anhydrous chloral, which had been kept in a sealed tube for over a year, exploded with considerable violence while undisturbed in a room at about 20° C. As the compound was found in the form of metachloral, it is probable that the explosion was due to sudden polymerization.

Synthesis of Hexamethylene-Glycol Diethyl Ether and Other Ethers from Trimethylene Glycol. By Arthur A.

NOYES. *Am. Chem. J.*, **19**, 766–781.—The results of the investigation are as follows: The monoethyl ether of trimethylene glycol is readily prepared by the action of sodium and ethyl iodide on a considerable excess of the glycol. The diethyl ether was prepared from the monoethyl ether, but not from the glycol itself, by a similar process. By the action of phosphorus trichloride, tribromide, and diiodide on the monoethyl ether, the hydroxyl was replaced by halogen with the production of ethyl chlor-, brom-, and iodpropyl ethers. The yields obtained were about 50, 75, and 30 per cent. respectively. Hydriodic acid gas at 0° caused replacement of the ethoxy as well as the hydroxyl group. The diethyl ether of hexamethylene-glycol was found to be produced in very small quantity by the action of sodium on an ethereal solution of ethyl chlorpropyl ether and in somewhat larger quantity by the similar reaction with the corresponding brom and iodo ether; but the best yields did not exceed 30 per cent. of the theoretical. By heating the ethyl brompropyl ether in a water-bath for several hours, first with a slight excess of concentrated aqueous potassium cyanide solution, and then with concentrated potash and acidifying, γ-ethoxyvalerianic acid was obtained in a 40 per cent. yield. It was shown that by the electrolysis of the salt of this acid a small quantity of hexamethylene-glycol diethyl ether is probably formed. Attempts to prepare a metallic derivative by the action of sodium amalgam and of the zinc-copper couple on the ethyl brompropyl ether, were unsuccessful. The Fittig synthesis was successfully carried out with the bromether and brombenzene, a 54 per cent. yield of ethyl γ-phenylpropyl ether being obtained. The ethoxypropyl radical was also readily introduced into malonic ester by heating its sodium compound with the ethyl brompropyl ether, the yield being 34 per cent. The substituted malonic ester so obtained gave on saponification and subsequent heating to 170° of the acid separated from its salt, δ-ethoxyvalerianic acid in a 37 per cent. yield. Another substance was produced at the some time in considerable quantity, but its nature was not determined.

Chemical Bibliography of Morphine, 1875-1896. BY H. E. BROWN. *Pharm. Rev.*, **15**, 204–205.—This important bibliography is being made under the supervision of A. B. Prescott, and when completed will be of great value.

GEOLOGICAL AND MINERALOGICAL CHEMISTRY.

W. O. CROSBY, REVIEWER.

Fractional Crystallization of Rocks. BY GEORGE F. BECKER. *Am. J. Sci.*, 154, 257–261.—This paper supplements the author's vigorous and effective criticism of the theory of magmatic differentiation based upon molecular diffusion in accordance with Soret's principle, as first proposed by Iddings (see this *Rev.*, 3, 67). In the former paper the author was content to demolish the prevalent theory, and confessed himself unable to propose any better alternative hypothesis than that the differences between well-defined rock types are due to original and persistent heteogeneity in the composition of the globe. But now he accepts differentiation as a fact and brings forward the simple and familiar principle of fractional crystallization to account for it. He conceives that during the circulation of the magma, due to inevitable convection currents, convection being the mortal enemy of any process of separation involving molecular flow, the less fusible constituents crystallize on the relatively cool walls, and the residual magma is composed in increasing proportion of the more fusible constituents, until the condition of maximum fusibility or eutexia is reached, after which differentiation necessarily ceases. The limitation imposed upon this process by viscosity is recognized; but in dikes and laccolites of mobile lavas, convection and fractional crystallization are inevitable. And this simple principle, which is the very opposite of magmatic differentiation and almost inseparable from consolidation, unquestionably affords the best explanation yet proposed of the differences observed in many igneous masses: and, as the theory requires, many homogeneous masses are undoubtedly approximately eutectic.

Eopaleozoic Hot Springs and the Origin of the Pennsylvania Siliceous Oolite. BY GEORGE R. WIELAND. *Am. J. Sci.*, 154, 262–264.—The author accepts the view of Bergt and Hovey that the beautiful siliceous oölite occurring in bowlders derived from the calciferous formation near the State College in Center County, Pa., is not pseudomorphic after ordinary or calcareous oölite, but due to direct deposition from silica-laden waters of Hot Springs. Additional confirmation of this view is afforded by the fact that in the limited oölite area and nowhere else in the entire region are found in considerable numbers bowlders of a built-up structure which may have formed the veins of hot springs or geysers. An analysis of the oölite shows 99.1 per cent. of silica. Analyses of two less pure varieties of siliceous oölite are also given.

Pseudomorphs from Northern New York. By C. H. Smyth, Jr. *Am. J. Sci.*, **154**, 309–312. Describes pseudomorphs of pyroxene after Wollastonite from Diana, and of mica after scapolite and pyroxene from near Gouverneur. The chemical relations of the species are considered, but no analyses are given.

On the Chemical Composition of Hamlinite and its Occurrence with Bertrandite at Oxford County, Maine. By S. L. Penfield. *Am. J. Sci.*, **154**, 313–316.—Only recently has enough of this rare phosphate for a complete analysis been found. The mineral was separated by heavy solutions from every associated species except apatite, and from this by boiling in dilute hydrochloric acid, all possible precautions being taken to obtain the hamlinite in a state of purity. Traces of adhering feldspar and mica, however, could not be wholly avoided; and to this source are referred the small proportions of Fe_2O_3, SiO_2, and of alkalies with their equivalent of the Al_2O_3, which the analysis reveals. Deducting these and calculating the remainder to 100 per cent., we have as the normal composition of hamlinite; P_2O_5, 30.20; Al_2O_3, 32.67; SrO, 19.25; BaO, 4.18; H_2O, 12.53; F, 2.01; corresponding very closely to the formula $[Al(OH)_2]_3[SrOH]P_2O_7$, the Sr being replaced by Ba in the ratio of 7 : 1, and the OH by F in the ratio of 13 : 1. In its chemical composition hamlinite holds a unique position among minerals as strontium and barium have never before been observed as essential constituents of a phosphate, and this is the first time that a pyrophosphate has been recorded.

Italian Petrological Sketches, V., Summary and Conclusion. By Henry S. Washington. *J. Geol.*, **5**, 349–377.—The volcanoes of the main Italian line, extending from Tuscany to Naples, embrace two types—great strata volcanoes, characterized by leucitic lavas and a great variety of products, and smaller but more prominent cones, the lavas of which are non-leucitic and consist of but a single extreme (acid or basic) type for each cone, the most of the lavas being referable to the trachy-dolerites, which include ciminite, vulsinite, and toscanite. In the descriptions of these subtypes all known reliable analyses, 41 in number, are quoted and discussed, and the normal proportions of the component minerals computed for each rock. In discussing the correlation of the trachy-dolerites, the author proposes a general classification of the feldspathic effusive rocks based upon the dominant feldspar and the proportion of silica. The classification and nomenclature of the leucitic lavas are regarded as provisional, the leading types being leucitite, leucite-basalt, leucite-basanite, leucite-tephrite, leucite-trachyte, and leucite-

phonolite. Each type is briefly characterized, and 18 analyses are selected for comparison and discussion. The interesting fact is thus brought out that the silica ratio, the upper limit of which is 60 per cent., does not present a perfect gradation, but the analyses are grouped about 49 and 56 per cent. A similar clustering of the analyses about definite points is noted for the trachydolerites, and for other constituents than silica, especially Fe_2O_3, FeO, MgO, and CaO. That is, in neither group do the analyses form a gradual series, from the most basic to the most acid, as Brögger understands a series to be constituted. A similar relation is shown to hold for the lavas of other regions; and an explanation is found in the theory of magmatic differentiation, the process having completed its course in these instances. The author concludes, however, that the two main groups of rocks do not represent two distinct primary differentiation products, but that their differences are due to diverse differences of extrusion and solidification. In other words, primary magmatic differentiation gives the distinction of acid and basic observed in each group, but the varying conditions of extrusion determin- the development, now of leucite and again of feldspars. The parent magma is shown to have been rich in potash and lime, and its normal composition is supposed to have been approximately: SiO_2, 57–58; Al_2O_3, 17–18; total iron oxides as FeO, 6–7; MgO, 2–3; CaO, 5.0–6.5; Na_2O, 2–2.5; K_2O, 7–8; H_2O, 1–1.5 per cent.

Secondary Occurrences of Magnetite on Islands of British Columbia by Replacement of Limestone and by Weathering of Eruptives. By James P. Kimball. *Am. Geol.*, **20**, 13–27.—Two separate types of ferriferous deposits, due to hydrochemical replacements, are recognized. One is a morphological replacement of limestone by double decomposition between ferrous salts and calcic carbonate, the former being derived from ferrous silicates; the other type is a partial, and not necessarily pseudomorphic, replacement of ferrous silicates in weathered basic rocks, or more explicitly, a residual concentration or fixation of iron oxides incidental to development of soluble alkaline carbonates from weathering oxidation or splitting up of ferriferous silicates. The common association of the deposits of this type with limestone is regarded as significant, calcic carbonate taking the place, in part, of the alkaline carbonates as an agent for the precipitation of ferric oxide. Among the causes determining the locus of deposition are recognized molecular or concretionary attraction of the mass for homologous matter in passing solutions, or even in suspension, the last being otherwise designated by the author as the extra molecular tendency of

ochreous material to form concretions or aggregations. As might be inferred from the above, the two types of deposit, that due to replacement of limestone, and that due to the replacement of basic silicates through the agency of contiguous limestone, are often intimately associated. The probable details of these metasomatic changes are stated; and the illustrative occurrences on three islands are described, the paper concluding with four analyses of magnetite from these and related deposits.

On the Magnetite Belt at Cranberry, North Carolina, and Notes on the Genesis of this Iron Ore in General in Crystalline Schists. By JAMES P. KIMBALL. *Am. Geol.*, **20**, 299–312.—This paper is in line with the preceding. The Cranberry iron ore deposits are described as obscurely defined lenses of magnetite in a persistent belt of pyroxene and amphibole; and the author, rejecting the theory of original magmatic differentiation as an explanation of these and many similar ore bodies, regards the magnetite and its encircling zone of epidote as derivatives through hydrochemical or weathering processes from the enclosing basic silicates. This view is supported by the observation that epidotization of pyroxene from weathering action is practically limited to the superficial zone of rock decay, increasing with proximity to the surface. But no facts are cited to show that the magnetite is also limited in depth; and the proof that the epidote is coeval with the magnetite or genetically related to it is inconclusive. Three analyses of the Cranberry ore are quoted, showing the composition of the purest magnetite obtainable, of the mixed magnetite and epidote, and of the ore as prepared for market, the percentages of metallic iron being respectively 64.64, 32.37, and 45.93. A notable proportion (seven per cent. in one instance) of the iron obtained in the furnace is attributed to ferrous and ferric oxides in the associated silicates —pyroxene and its derivative (epidote)—an analysis of pure pyroxene giving 24.01 per cent. of metallic iron. In the further discussion of the origin of these and similar ore deposits, the author holds that even if we grant that magmatic differentiation has played a part, it must have been supplemented by subsequent hydrochemical processes to convert the original ferriferous silicates (pyroxene, etc.) to bodies of highly concentrated magnetite.

The Fisher Meteorite. Chemical and Mineral Composition. By N. H. WINCHELL. (CHEMICAL ANALYSIS, BY C. P. BERKEY.) *Am. Geol.*, **20**, 316–318.—Prof. Winchell gives the results of microchemical tests for determining a mineral resembling maskelynite. Not enough of the mineral is present to warrant a quantitative analysis; and the presence of maskelynite

is inferred from the feeble polarization, absence of cleavage, presence of lime and soda, and the fact that the glass from which it seems to have crystallized contains soda, and no soda has been detected in the other minerals. Mr. Berkey gives a bulk analysis of the meteorite, showing the presence of Si, Al, Fe, Ni, Ca, Mg, and S. The sulphur is present in small quantity in the mineral troilite and no alkalies were found.

Note on the Hypersthene-Andesite from Mt. Edgecumbe, Alaska. By H. P. Cushing. *Am. Geol.*, **20**, 156–158.—The specimens examined were collected by H. F. Reid in the crater of the volcano, which has probably not been long extinct. They are a quite normal hypersthene-augite-andesite made up of plagioclase, hypersthene, augite, and magnetite, in the order of abundance. It is the only occurrence of andesite reported from Alaska, except the hornblende-andesite of Bogosloff Island, and it is of interest from the fact that similar lava is found throughout the whole extent of the American Sierra belt.

Ferric Sulphate in Mine Waters, and Its Action on Metals. By L. J. W. Jones. *Proc. Col. Sci. Soc.*, June 5, 1897, 1–9.—The corrosive action of the water of the Stanley Mine, Idaho Springs, Col., is so great that ordinary iron pipe cannot long resist it. The substitution of copper and various alloys for iron proved unavailing. On standing, the water yields a muddy brown precipitate which, after drying, gave on analysis: Fe_2O_3, 53.57; Al_2O_3, 2.87; SiO_2, 10.85; SO_3, 11.46; H_2O, 21.14; total, 99.89 It is evidently a hydrated basic sulphate of iron. An analysis of the water filtered off from the precipitate shows, besides silica and sodic chloride, sulphate of Na, K, Al, Zn, Mn, Mg, Ca, Fe (ferrous and ferric), and Cu, the ferric, calcic, magnesic, and sodic sulphates predominating, and the whole slightly exceeding three parts in one thousand. Free sulphuric acid is not present, and the corrosive action of the water is attributed in part to the copper sulphate, but chiefly to the ferric sulphate. After noting the action of the water the lead, copper, and bronze, the conclusion is reached that wooden pipes are the most serviceable.

1. Lead and Zinc Ores of Iowa. By A. G. Leonard. **2. The Sioux Quartzite and Certain Associated Rocks.** By S. W. Beyer. **3. Artesian Wells of Iowa.** By W. H. Norton. *Iowa Geol. Survey*, **6**, 11–429.—In the first paper the chief sources of the world's supply of lead and zinc are cited, and their mode of occurrence in north-eastern Iowa fully described. The lead occurs mainly as sulphide, and the zinc as carbonate; the two ores being associated, but seldom intermingled. The

concentration has been effected by lateral secretion from the limestone by infiltrating surface waters.

2. The Sioux quartzite extends across the north-western corner of Iowa into Minnesota and South Dakota; but the author considers especially its exposures and its relation to certain associated rocks in the latter state. The quartzite is there cut by a large mass of olivine diabase; and the alteration products of the feldspar, augite, and olivine of the diabase are described.

3. After a general discussion of the definition and theory of artesian wells and of artesian conditions in Iowa, the author gives a detailed record of the wells in the state and chemical analyses of the waters, many of which are strongly mineral. The contained gases are ammonia, hydrogen sulphide, and carbon dioxide, oxygen not having been observed. The dissolved solids are carbonates of Ca, K, and Fe; bicarbonates of Mg and Na; phosphates of Mg and Na; sulphates of Ca, Mg, Na, and K; ferric oxide; chlorides of Mg, Na, and K; silica and alumina, some of the wells containing a greater proportion and larger variety than others. Their sanitary, therapeutic, and industrial value are discussed, and analyses are also given of the river, surface, and drift waters of the state.

The Marquette Iron-bearing District of Michigan. By Charles Richard Van Hise and William Shirley Bayley. *Monographs U. S. Geol. Survey*, **28**, 1–608.—This elaborate and beautifully illustrated report is designed as a final account of the geological structure and petrography of the oldest iron-producing area of the Lake Superior region. The petrographic descriptions are accompanied now and then by analyses of the rocks—granitite, gneiss, schist, slate, greenstone, peridotite, serpentine, etc. The chief iron-bearing horizon is the Negaunee formation; and it is here that the chemical interest of the report culminates. Petrographically the iron-bearing formation comprises sideritic slates, which may be grüneritic, magnetitic, hematitic, or limonitic; grünerite-magnetite-schists; ferruginous slates; ferruginous cherts; gaspilite; and iron ores. The descriptions of these rocks, with analyses of the sideritic slates, grünerite-magnetite-schists, and jaspilite, are followed by a section on the origin of the ores, which may be summarized as follows: The ores are not eruptive. The original form of the iron is the carbonate-siderite; and the whole of the iron-bearing formation was probably originally a clean cherty carbonate of iron with some calcium and magnesium. From this rock the ferruginous cherts and jaspers were developed by peroxidation of the iron and solution of the calcareous materials. The ore bodies proper are due to a secondary enrichment by the

action of downward percolating water. They invariably rest upon an impervious substratum, usually of soaprock, and the convergence of the downward-flowing waters determined by pitching synclines or the intersection of the impervious soaprock by greenstone dikes has favored the concentration of the ore. The immediate cause of the deposition of the iron at these points is found in the oxidation of the dissolved carbonate by oxygen-bearing waters coming more directly from the surface. It is further essential to the formation of pure ores that the waters, rendered alkaline by the alteration of alkaline silicates to soaprock, should dissolve and remove large amounts of silica (chert, etc.).

Geology of the Denver Basin in Colorado. By Samuel Franklin Emmons, Whitman Cross, and George Homans Eldridge. *Monographs U. S. Geol. Survey*, 27, 1–556.—In this very complete study of a limited area of only moderate geologic complexity, we find analyses of the rocks of greatest chemical interest, including Wyoming and Niobrava limestones, the Benton and Laramine iron stones (earthy and concretionary carbonates), löess, dolerite and augite from it, basalt, augite-mica-syenite, tuff, coals, and fire-clays; and also artesian waters. The löess is distinguished from that of the Mississippi and Rhine valleys by its higher proportion of alkalies, indicating that, owing to the avidity of the climate, the feldspathic constituent is but little decomposed. The numerous analyses of coal were made partly in Denver, and partly in Washington; and the curious fact is developed that, although they were all made by the same chemist, in the same manner, with the same care, and at the same temperature, the Washington analyses showed from 3 to 5 per cent. less moisture than the Denver analyses, while the volatile combustible matters are found to vary in the opposite direction, increasing as the water decreases. The specific gravities also vary inversely as the water and directly as the volatile combustible matters. It is a significant fact that the sum of the volatile combustibles and water is approximately the same for both the Washington and Denver analyses. The discussion of these anomalous and seemingly contradictory facts leads to the conclusion that the hygrometric condition of the atmosphere must be the cause of these persistent discrepancies. In the drier atmosphere of Denver, under less barometric pressure, the coals parted with a greater amount of moisture than it is possible to expel under the usual conditions of analysis in the more moist atmosphere and with the higher barometer of the east. Since the water not expelled must be reckoned as volatile combustible matter, the economic value of the coal is

involved; and it is suggested that the limits of the atmospheric influence should be determined and taken into account in all future analyses of coal. The fixed carbon is found to increase with the depth, ranging in the Golden mines from 38.32 per cent. at 130 feet, to 43.42 per cent. at 650 feet. The further discussion includes the ash, fuel ratio, and classification of the coals. A comparison of the fire-clays with those of Eastern and European localities, and with pure kaolin, shows that they are in the main of excellent quality. In connection with an extended account of the artesian wells, relating chiefly to the geological conditions, available supply of water, rate and diminution of flow, four analyses by Prof. Chauvenet are quoted, the total solids ranging from 17.20 to 56.60 parts in 100,000, sodium carbonate largely predominating.

The Gold Quartz Veins of Nevada City and Grass Valley, California. By WALDEMAR LINDGREN. *U. S. Geol. Survey, Ann. Rep.*, 17, *Part 2*, 1–262.—The first essential to understanding the geology of this region is the distinction of the bed-rock series of crystalline schists and ancient igneous rocks and the relatively modern gravels, sands, clays and volcanic rocks which overlie them horizontally. The igneous rocks of the bed-rock series are in the main of mixed granitic and dioritic (granodiorite) character and of complex mineralogical and chemical composition. They also include diabases, gabbro, pyroxenites, peridotites, porphyrite and amphibolite, analyses of which are given, as well as of serpentine derived from the basic eruptives, and the superjacent rhyolite tuffs, and associated clays and sandstones. The sedimentary rocks, including clay slate, siliceous argillite (of which one complete analysis is given), quartzitic sandstone and chert, are supposed to be altered Carboniferous strata, and are distinctly older than the granodiorite and diabasic series; while above them is a series of clay slates of the upper Jurassic. The metamorphic processes to which these rocks have been subjected are: Regional or dynamo-chemical metamorphism; contact metamorphism; hydro, hydrothermal, and solfataric metamorphism; serpentinization of magnesian silicates; and surface weathering. Each process is briefly described and its products enumerated. The development of the iron sulphides is specially considered, as having an important bearing upon the genesis of the ore deposits; and for the same reason the section on the mineralogy of the veins is accompanied by analyses of the mine waters and the deposits which they form, and of the liquid inclusions of the quartz. Several analyses of the sulphurets (concentrates), amounting to 2 to 3 per cent. of the ore, show the normal ratios of the base

metals, as well as of gold and silver. The changes in the rocks, due to the formation of the veins, are discussed at some length, with numerous analyses. In the discussion of the genesis of the veins the conclusion is reached that they were formed at a great depth by ascending thermal waters, lateral secretion playing but a very minor part; and in confirmation of this view numerous assays and analyses are cited, showing that the wall rocks rarely contain appreciable traces of gold. The details of the discussion relate to the origin of the metals and gangue, solubility and synthesis of the gangue minerals, sulphides, and gold, relation of solubility to temperature and pressure, precipitation of the gold and mode of deposition of the vein minerals.

Geology of Silver Cliff and the Rosita Hills, Colorado. By WHITMAN CROSS. *U. S. Geol. Survey, Ann. Rep.*, 17, *Part 2*, 263–403.—In the geological history of this district an ancient complex of granite and various gneissic rocks was cut by dikes of syenite, diabase and peridotite, and then subjected to prolonged erosion previous to the outbreak of volcanic action. This volcanic center is comparable to the one at Cripple Creek, and from it poured at successive periods varieties of andesite, diorite, dacite, rhyolite, trachyte, and finally the Bassick agglomerate. Nearly all of these types were analyzed, and the rocks of the volcanic series are tabulated for comparison. The decomposition products are of great extent and interest; and analyses are given of quartz-alunite rock (the first known occurrence in this country of crystalline alunite as a rock constituent), quartz-diaspore rock, pitchstone and the siliceous clay derived from it, and muscovetized rocks derived from several vulcanic types. The sequence of the lavas is discussed and the evidences of differentiation noted.

The Mines of Custer County, Colorado. By SAMUEL FRANKLIN EMMONS. *U. S. Geol. Survey, Ann. Rep.*, 17, *Part 2*, 405–472.—This monograph supplements the preceding, discussing the mining geology of Rosita and Silver Cliff, as that does the general geology. It is in the main an account of four mines, representing four types of deposits. The Pocahontas-Humbolt is a true fissure vein. The Bassick is the most typical example yet described of a neck vein, consisting of a well-defined ore-shoot or chimney formed by fumarole action in the coarse andesitic agglomerate filling an old volcanic neck, and the ore, of which a single analysis is given, occurring as successive coatings on the rounded masses and bowlders of andesite. The Bull Domingo is structurally similar to the Bassick, being a nearly vertical chimney in a conglomeratic mass of the granite and gneiss country rock, with the ores coating the bowlders and

fragments; but the origin of the bowlder zone or stock is found in the intersection of a complicated series of fractures and not in volcanic action. At Silver Cliff the ore (silver chloride) occupied irregular cracks in the surface flow of rhyolite, but in the deep workings of the Geyser Mine, where the rocks are firmer, the ore (argentiferous sulphides) forms a well-defined but narrow vein. This mine, now one of the deepest in the West, is described in detail, with complete analyses of the decomposition products of the rhyolite, the ores and gangues, the calcareous and slightly metalliferous sinters deposited by the mine waters, the vadose or surface waters from the upper levels of the mine, and the similar but more concentrated deep waters from the lower levels. The relations of these waters to the ore deposition are discussed, and as evidence that the ores of this district may have been derived from the enclosing formations. Ten assays of the country rocks are given, all but four showing appreciable amounts of silver. In conclusion this district is compared, as regards the character of the ores, with the analogous Cripple Creek District, forty miles north of it.

The Tennessee Phosphates. By CHARLES WILLARD HAYES. *U. S. Geol. Survey, Ann. Rep.*, **17**, *Part 2*, 513–550.—A preliminary account of these phosphates appeared in the 16th Annual Report (see *this Rev.*, **2**, 57). They are classed as structural varieties of the two main types—the black and the white phosphates, the former originating in the deposition of a bed of phosphatic organisms in the Devonian Sea, while the latter is a secondary and essentially residuary deposit due to the differential solvent action of meteoric waters on phosphatic limestones. Analyses are given only for the white phosphates, giving from 27.4 to 33.4 per cent. of calcium phosphate ($Ca_3P_2O_8$).

The Underground Waters of the Arkansas Valley in Eastern Colorado. By GROVE KARL GILBERT. *U. S. Geol. Survey, Ann. Rep.*, **17**, *Part 2*, 551–601.—The water-bearing strata of this district are the sandstones of the Dakota group, the lowest member of the Cretaceous formation. A detailed account of the geological structure of the valley precedes the discussion of the water supply. The analyses of the artesian waters show a rather complex mineral constitution, with salts of Na, Ca, and Mg predominating, the maximum total solids being over 4,000 parts in 1,000,000.

Preliminary Report on Artesian Waters of a Portion of the Dakotas. By NELSON HORATIO DARTON. *U. S. Geol. Survey, Ann. Rep.*, **17**, *Part 2*, 603–695.—The water-bearing formation, as in the Arkansas Valley, is the Dakota sandstone, which re-

ceives its supply where it outcrops to the westward in the foot hills of the Rocky Mountains and the Black Hills, and which underlies nearly the whole of North and South Dakota, rising again to the surface near their eastern boundaries. The water is saline, containing considerable amounts of NaCl, and carbonates and sulphates of Na, Ca, and Mg, but rarely enough to affect its usefulness.

The Water Resources of Illinois. By FRANK LEVERETT. *U. S. Geol. Survey, Ann. Rep.*, 17, *Part 2*, 695–828.—The rainfall and drainage of the state are discussed and the sources of supply of water for power and for the use of cities, villages, and rural districts, are described. The wells afford chiefly surface waters, but numerous analyses are given for both shallow and artesian wells, showing the proportions of inorganic and organic impurities. Few of the waters are strongly mineral, but many are seriously contaminated by drainage.

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[CONTRIBUTION FROM THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY.]

REVIEW OF AMERICAN CHEMICAL RESEARCH.

VOL. IV. NO. 2.

ARTHUR A. NOYES, Editor; HENRY P. TALBOT, Associate Editor.
REVIEWERS: Analytical Chemistry, H. P. Talbot and W. H. Walker; Biological Chemistry, W. R. Whitney; Carbohydrates, G. W. Rolfe; General Chemistry, A. A. Noyes; Geological and Mineralogical Chemistry, W. O. Crosby; Inorganic Chemistry, Henry Fay; Metallurgical Chemistry and Assaying, H. O. Hofman; Organic Chemistry, J. F. Norris; Physical Chemistry, H. M. Goodwin; Sanitary Chemistry, E. H. Richards; Technical Chemistry, A. H. Gill and F. H. Thorp.

GENERAL AND PHYSICAL CHEMISTRY.

A. A. NOYES, REVIEWER.

The Dissociation of Electrolytes as Measured by the Boiling Point Method. By HARRY C. JONES AND STEPHEN H. KING. *Am. Chem. J.*, **19**, 753–756.—The authors have determined the rise in boiling-point produced by dissolving potassium iodide and sodium acetate in alcohol, their chief object being to show the constancy of the values obtained by Jones' modification of the Beckmann apparatus (*this Rev.*, **3**, 183) and the practicability of determining dissociation values by means of it. In the case of potassium iodide, the concentration varied in five experiments between 1.8 and 3.1 per cent., and the dissociation values between 25.4 and 27.2 per cent.; while in the case of sodium acetate for concentrations between 1.0 and 2.1 per cent., the dissociation was only 1.0 to 1.8 per cent. These results are regarded as preliminary.

The Rate of Solution of Solid Substances in their own Solutions. By ARTHUR A. NOYES AND WILLIS R. WHITNEY. *J. Am. Chem. Soc.*, **19**, 930–934.—The authors have found, by agitating sticks of benzoic acid and of lead chloride with water for different lengths of time, that "the rate at which a solid substance dissolves in its own solution is proportional to the difference between the concentration of that solution and the concentration of the saturated solution."

On a Possible Change of Weight in Chemical Reactions. By FERNANDO SANFORD AND LILIAN E. RAY. *Phys. Rev.*, **5**, 247–253.—The authors have carried out a series of experiments similar to those of Landolt (*Ztschr. phys. Chem.*, **12**, 1). They find that, when ammoniacal silver nitrate and grape sugar solutions are caused to react within a closed vessel, the change of weight

observed does not exceed the probable errors of the weighings, which is calculated to be about 0.04 milligram or $\frac{1}{3.000.000}$ part of the weight of the reacting substances.

Note on the Rate of Dehydration of Crystallized Salts. By Theodore William Richards. *Proc. Am. Acad.*, 33, 23–27. —The author has made experiments showing that crystallized barium chloride ($BaCl_2.2H_2O$), when placed in a desiccator over phosphorus pentoxide, loses its water rapidly and fairly uniformly until one molecule of water has escaped, and that then the rate of loss suddenly becomes much less, but again remains quite uniform as the dehydration progresses. The author seems to have overlooked the fact that similar experiments giving the same result have been made with this very salt by Müller-Erzbach (*Wied. Ann.* 27, 623). Andrea (*Ztschr. phys. Chem.*, 7, 241) has also made accurate and extensive experiments in the same direction. The author has also compiled from existing data a table showing the specific gravity of sulphuric acid solutions which have definite vapor-pressures at 20°, 25°, and 30°.

Two Liquid Phases, II. By Wilder D. Bancroft. *J. phys. Chem.*, 1, 647–668.—There is given in this article "a graphical summary of the equilibria in three-component systems when one pair, two pairs, and three pairs of the components can form two liquid phases." In the latter part of the paper the author claims that the chemists who have investigated the principles of solubility-effect have stated that the solubility of any substance can be affected only by those other substances which bring into the solution one of its dissociation-products. As a matter of fact, no such absurd statement has ever been made by the "quantitative physical chemists;" on the contrary, the reviewer has emphasized on different occasions (*Ztschr. phys. Chem.*, 6, 243; 9, 603) the fact that the solubility-principles cannot be expected to hold true exactly, when the second substance is of such a nature or is added in so large an amount as to produce an appreciable change in the solvent power of the solvent.

The Electrolysis and Electrical Conductivity of Certain Substances Dissolved in Ammonia. By Hamilton P. Cady. *J. phys. Chem.*, 1, 707–713.—The author has made the interesting discovery that many salts dissolved in liquid ammonia at —34° have even a greater electrical conductivity than when dissolved in pure water at + 18°. The ammonia employed was the commercial article used in the manufacture of ice; it had a conductivity of 71×10^{-7}. As it no doubt contained impurities, and as there were difficulties in the determinations, the results are regarded only as preliminary. They serve, however, to

give a general idea of the prevailing conditions. The molecular conductivity of salts was found to increase with the dilution as in the case of water. Some salts, especially mercury iodide and cyanide, which have only a very slight conductivity in water, were found to be good conductors, showing that the dissociating power of ammonia is greater than that of water. The rate of motion of ions through it seems also to be greater than through water. The author has also submitted the solutions of a number of salts in ammonia to electrolysis: in the case of lead, mercury, and silver salts, the metals are deposited on the cathode; in the case of iodides, a dark-colored explosive compound, believed to be HN_3I, separated at the anode; with potassium iodide, potassium amide was probably formed at the cathode; etc. The most remarkable results were obtained with a solution of metallic sodium. Although an excellent conductor, there was no indication of electrolysis when a current was passed through: no deposit formed on the electrodes; no gas was set free; and no polarization-current could be detected. The article seems to the reviewer to open up a most interesting and important field of investigation; and it is to be hoped that the author will continue the work under improved conditions as soon as possible.

Precipitation of Salts. By A. Ernest Taylor. *J. phys. Chem.*, 1, 718–733.—The article describes a continuation of the work previously referred to (*this Rev.*, 3, 75, 122, 152).

A Revision of the Atomic Weight of Nickel. I. The Analysis of Nickelous Bromide. By Theodore William Richards and Allerton Seward Cushman. *Proc. Am. Acad.*, 33, 97–111.—Commercial nickel and pure nickel obtained by the carbon monoxide process were subjected to extensive processes of purification. From the former, two samples of nickel bromide were obtained differing from one another in the number of purifying operations to which they had been submitted; and from the latter two further samples even more carefully purified were prepared. In addition to the usual methods of purification, the ammonia compound $NiBr_2.6NH_3$ was repeatedly crystallized from strong ammonia; and the nickel was three times fractionally precipitated by electrolysis. All four samples of nickel bromide were sublimed, ignited at 400° in a current of hydrobromic acid, and cooled in nitrogen. The exact quantity of silver required for its precipitation was determined; and the silver bromide formed was weighed, thus giving two independent ratios, $2AgBr : NiBr_2$ and $2Ag : NiBr_2$. The mean value of the atomic weight obtained from the former ratio in seven experiments made with the two most carefully purified samples was 58.690

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(±0.003), while that obtained from the latter ratio was 58.691 (±0.005). Very strong evidence of the purity of the substance analyzed is furnished by the fact that the four samples, which had been submitted successively to more numerous processes of purification, gave nearly the same results; namely, 58.677, 58.683, 58.688, 58.689. The authors adopt 58.69 (O = 16) as the most probable value. That given by Clarke in his last year's report was also 58.69.

A Revision of the Atomic Weight of Cobalt. I. The Analysis of Cobaltous Bromide. By THEODORE WILLIAM RICHARDS AND GREGORY PAUL BAXTER. *Proc. Am. Acad.*, **33**, 115–128. —This investigation is closely analogous to that on the atomic weight of nickel described in the preceding review. The cobaltous bromide used was purified, after removal of the metals of the hydrogen sulphide group, by three processes: first, by precipitation of the potassium cobaltic nitrite and subsequent electrolytic deposition of the metal; second, by precipitation in the form of the purpureochloride and subsequent electrolytic deposition; and third, by a combination of both these processes. The bromide was in each case finally sublimed, ignited in a current of hydrobromic acid, and cooled in one of nitrogen. The mean value of the atomic weight obtained from nine determinations of the ratio $2AgBr : CoBr_2$ was 58.995 (±0.003), while that from eight determinations of the ratio $2Ag : CoBr_2$ was 58.987 (±0.005). The four differently purified samples gave 58.987, 58.992, 58.995, and 59.004. The authors adopt 58.99 as the most probable value, while that given by Clarke in his last year's report was 58.93.

H. M. GOODWIN REVIEWER.

On Electrosynthesis. By W. G. MIXTER. *Am. J. Sci.*, **154**, 51–62.—Electrosynthesis the author defines to be the chemical union of substances by an electric discharge as distinct from combination effected by the heat of the discharge. A feeble glow discharge from an induction coil driven by one storage cell and giving a spark in air about one centimeter long was used in the experiments for effecting the combination. The amount of combination of oxygen with hydrogen in a discharge tube connected in series with the tube under investigation, served in all cases as an arbitrary standand of reference. A measure of the chemical action was obtained by absorbing the products of the combination directly in the vacuum tube and noting the corresponding diminution of pressure on a manometer. Experiments were made at varying pressures. If the number of hydrogen and oxygen molecules combining be taken as 100, the corresponding values for the mixtures of other gases with oxygen are

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as follows: Carbonic oxide, 113; methane, 149; ethylene, 300; acetylene, 320,; and ethane, 150. From a consideration of these results the author concludes that the glow discharge renders gaseous molecules chemically active, and that the molecular charges involved in "electrosynthesis" are analogous to those often produced by light, or by heat at temperatures below that at which gaseous dissociation is measured.

On the Temperature-Coefficient of the Potential of the Calomel Electrode, with Several Different Supernatant Electrolytes. By THEODORE WILLIAM RICHARDS. *Proc. Am. Acad.*, 33, 1–20.—This is an experimental study of the electromotive force of elements of the type Hg, HgCl, MCl_n, HgCl, Hg, the two electrodes being at different temperatures. A careful preliminary study of the causes affecting the potential difference of calomel electrodes revealed the fact that the depolarizer HgCl is slightly decomposed into mercuric chloride and mercury; the amount of decomposition being greater, the higher the temperature and the more concentrated the soluble electrolyte, MCl_n, present. To this fact is attributed the slight inconstancy of normal calomel elements. It is suggested that a decinormal calomel electrode would be a more constant standard electrode, on this account. Measurements of the temperature-coefficient between 0° and 30° of calomel electrodes in contact with normal, decinormal, and centinormal solutions of eleven different soluble chlorides showed that it invariably diminishes with increasing concentration. The diminution is shown to be very approximately in the ratio of the logarithm of the concentrations. Hydrochloric acid and ammonium chloride are anomalous in their behavior.

ANALYTICAL CHEMISTRY.

ULTIMATE ANALYSIS.

H. P. TALBOT, REVIEWER.

The Estimation of Phosphorus in Steel. By R. W. MAHON. *J. Am. Chem. Soc.*, **19**, 792–795.—The author describes a rapid method, successfully used with steels low in carbon and silicon and free from arsenic, which, he claims, will afford accurate results in about eight minutes. The procedure includes the partial neutralization of the nitric acid and the precipitation of the phosphomolybdate at a temperature near the boiling-point, and after shaking for fifteen seconds. The precipitate and filter are placed in a measured excess of caustic alkali; and the excess is determined by standard acid, with phenolphthalein as an indicator.

The Titration of Stannous Salts with Iodine. By S. W. Young. *J. Am. Chem. Soc.*, **19**, 809–812.—The author states that the reaction between stannous chloride and iodine, by which the former is oxidized, takes place smoothly in acid solution, and may be utilized for the determination of tin. The iodine solution is standardized against potassium bichromate with the intervention of a stannous chloride solution of known value. The statements are made that "thiosulphate cannot be satisfactorily used in acid solution to titrate against iodine," and that "the standard of iodine by thiosulphate is likely to be a trifle high;" but no authorities are quoted nor experimental data offered in support of these assertions.

The Electrolytic Determination of Cadmium. By Daniel L. Wallace and Edgar F. Smith. *J. Am. Chem. Soc.*, **19**, 870–873.—The paper presents data which refute the statements of Heidenreich (*Ber.*, **29**, 1585) and Avery and Dales (*this Rev.*, **3**, 123), in which they deny that cadmium can be precipitated electrolytically from solutions of the acetate and sulphate, and that a separation of cadmium and copper can be effected in nitric acid solution. Under the conditions prescribed in this paper the precipitation of the cadmium by electrolysis appears to be complete, as previously affirmed.

The Analysis of Bearing-Metal Alloys, with a New Volumetric Method for Determining Copper. By W. E. Garrigues. *J. Am. Chem. Soc.*, **19**, 934–948; *Proc. Eng. Soc. W. Penna.*, **13**, 415–430. The analysis of bearing-metal alloys is treated in this paper from a general standpoint, their sources of inaccuracy are discussed, and remedies are suggested. For the determination of copper, the precipitation of the metal as cuprous thiocyanate, filtration, and the treatment of the precipitate with an excess of caustic alkali are suggested. The excess of the alkali is then determined by titration.

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ANALYTICAL CHEMISTRY.

ULTIMATE ANALYSIS.

HENRY FAY, REVIEWER.

Iodometric Determination of Selenious and Selenic Acids. BY JAMES F. NORRIS AND HENRY FAY. *Am. Chem. J.*, **18**, 703–706.—It is shown that selenious acid can be titrated with sodium thiosulphate, one molecule of the former being equivalent to four of the latter. Definite portions of pure selenious acid, which had been resublimed in the presence of a small quantity of nitric acid, were treated in ice-cold solution with an excess of sodium thiosulphate in the presence of enough hydrochloric acid to set free all of the thiosulphuric acid; and the excess of sodium thiosulphate was found by titrating back with iodine. An excess of hydrochloric acid may be used, provided the solution is kept cold. For the determination of selenic acid measured portions were treated with 25 cc. concentrated hydrochloric acid, and the solution was diluted to 100 cc. The solution is boiled for one hour, precautions being taken not to allow the volume to fall below 75 cc.; it is then cooled, diluted with ice-water, and the selenious acid determined by titration. The results of both determinations are accurate; and the method can be used for the determination of a mixture of selenious and selenic acids. The exact nature of the reaction between sodium thiosulphate and selenious acid has not been determined.

W. H. WALKER, REVIEWER.

Separation of Aluminum and Beryllium by the Action of Hydrochloric Acid. BY F. S. HAVENS. *Am. J. Sci.*, **154**, 111–

114. The method of Gooch and Havens (*this Rev.*, **3**, 30) for the separation of aluminum from iron is here extended with very little variation to the separation of aluminum from beryllium. After removal of the aluminum, the beryllium is determined by evaporating the ether-acid solution to dryness, moistening with strong nitric acid, igniting, and weighing as beryllium oxide.

J. F. NORRIS, REVIEWER.

Combustion of Organic Substances in the Wet Way. BY I. K. PHELPS. *Am. J. Sci.*, **154**, 372–383.—In a former paper (*Am. J. Sci.*, **152**, 70) the author has shown that carbon dioxide can be estimated iodometrically. He has now applied the method to the estimation of carbon in organic substances, the combustion being effected in solution. The carbon dioxide evolved is passed into a standardized solution of barium hydroxide, the excess of which is determined by heating with iodine and titrating the excess of the latter with arsenious acid. One molecule of barium hydroxide is equivalent to one molecule of iodine. Ammonium oxalate, barium formate, and tartar emetic were successfully analyzed in this way when potassium permanganate was used as the oxidizing agent. The carbon in these substances, as well as in phthalic acid, cane-sugar, and paper, was determined by oxidizing with potassium bichromate. The amount of oxygen necessary to oxidize an organic substance was determined by using a known weight of potassium bichromate and estimating the excess of the latter by digesting with hydrochloric acid, absorbing the evolved chlorine in a standard solution of sodium arsenite, and titrating with iodine. Reference must be made to the original article for a description of the apparatus and details of the method.

PROXIMATE ANALYSIS.

W. R. WHITNEY, REVIEWER.

On the Action of Sulfuric Acid upon Strychnine in the Separation of this Alkaloid from Organic Matter. BY E. H. S. BAILEY AND WM. LANG. *Kan. Univ. Quart.*, **6**, 205–207; *Am. J. Pharm.*, **70**, 18–21.—The authors have found that the limit of the test for strychnine, in which the color effect produced by potassium bichromate and sulphuric acid is employed, is 0.00025 milligram of the alkaloid. They also found that, if the dry strychnine residue be first heated in the water-bath fifteen minutes with the concentrated acid, before the crystal of bichromate is introduced, the delicacy of the test is reduced to 0.0011 milligram; while in employing a chloroform extraction of the alkaloid from other organic matter, or as nearly as possible, conforming with the test as it is usually applied, a quantity of

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strychnine less than 0.02 milligram could not be detected. That is; the greatest source of error in the ordinary strychnine determinations lies in incomplete extraction by chloroform.

J. F. NORRIS, REVIEWER.

The Volumetric Determination of the Nitro Group in Organic Compounds. BY S. W. YOUNG AND R. E. SWAIN. *J. Am. Chem. Soc.*, **19**, 812–814.—The authors show that a quantitative determination of the nitro groups in dinitrobenzene can be made by reduction with a standardized solution of stannous chloride and titrating the excess of the latter. The method has already been applied to a large number of nitro compounds by Limpricht (*Ber. d. chem. Ges.*, **11**, 35, 40).

ASSAYING.

H. O. HOFMAN, REVIEWER.

Fire-Assay for Lead. BY JOHN F. CANNON. *Eng. Min. J.*, **64**, 604.—The assay is made as follows: Weigh out 5 grams of ore, place it in a 5-gram crucible containing 20 grams lead flux (16 parts sodium bicarbonate, 16 potassium carbonate, 8 glass borax, 5 flour), mix, tap to settle the mixture, add 20 grams of lead flux, tap, add 4–5 nails, place in a bright-red muffle, fuse in 20–25 minutes, close the muffle when the fusion has become quiet, heat to perfect fluidity, take out the crucible, remove the nails, tapping them to free them from adhering lead, tap the crucible and pour its contents on a level cast-iron plate, stringing out the slag to a thin thread, when even the smallest lead button will be found at the extreme end of the slag. Free the button from slag, hammer out thin on an anvil, and weigh.

The Jones Coupel Moulder. BY THE PARKE AND LACY CO. *Min. Sci. Press*, **75**, 357; *Eng. Min. J.*, **64**, 521.—This is a device by means of which the bone ash in the coupel mould is compacted by continuous and increasing pressure exerted by a system of levers and toggles worked by a foot-lever.

Corrected Assays. BY E. H. MILLER. *School Mines Quart.*, **19**, 43–47.—The author determined the losses in silver occurring with the niter and cyanide methods from assaying an argentiferous galena ore and a dry gold-bearing silver ore, containing some malachite. He found that with the cyanide method silver is carried off in the slags, which is not fully recovered by re-treatment.

TECHNICAL CHEMISTRY.

G. W. ROLFE, REVIEWER.

The Principal Amid of Sugar-Cane. BY EDMUND C. SHOREY. *J. Am. Chem. Soc.*, **19**, 881–889.—The author has isolated the characteristic amid of the juice from fifteen samples of sugar-cane and demonstrated that this body is glycocoll (glycocin) and not asparagin, as generally supposed. The differentiation has been carefully worked out by an elaborate comparison of the characteristic reaction of the sugar-cane amid with those of pure glycocoll and asparagin. The formation of hippuric acid by synthesis of this amid with benzoic acid as well as its being a derivative of gelatin is especially significant to animal and vegetable physiology. This paper is important as promising to throw light on the constitution of the proteids.

Crystallization in Motion. BY E. P. EASTWICK, JR. *La. Planter and Sugar Mfgr.*, **20**, 43–45.—A very clear exposition of the theory and its application in the production of second sugars. The advantages claimed for the new process over the usual method of boiling "blank" and crystallizing in the "hot-room" are: (1) Increased quantity and better quality of sugar; (2) Decreased quantity and lighter-colored molasses; (3) Reduced cost of building and machinery; (4) Reduced expense of labor; (5) Completion of the production of second sugars by the end of the crop. These advantages are certainly great ones, but it is doubtful whether the statement of the author that the process has gone beyond the experimental stage will be generally accepted.

Crystallization by Motion. BY JOS. E. KOHN. *La. Planter and Sugar Mfgr.*, **20**, 45.—The author gives arguments from a theoretical standpoint why crystallization in motion is desirable.

Note on Hydrolysis of Starch by Acids. BY G. W. ROLFE AND GEO. DEFREN. *J. Am. Chem. Soc.*, **19**, 679–680.—The authors regret having omitted to refer in their previous article to work on this subject by Prof. H. W. Wiley.

BIOLOGICAL CHEMISTRY.

W. R. WHITNEY, REVIEWER.

Pomegranate Rind. BY HENRY TRIMBLE. *Am. J. Pharm.*, **69**, 634–636.—This material has been used to some extent in tanning, and the author finds in the fresh rind 28.38 per cent. tannin. The pure tannin was investigated, and from its composition and chemical properties the author concludes that it is identical with gallotannic acid.

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Hemlock Tannin. By Henry Trimble. *Leather Manufacturer*, **8**, 88–89.—The percentage of tannin in hemlock bark collected at different seasons, in Pennsylvania and Tennessee, are given. The maximum (calculated for dry bark) is 15.45; the minimum, 8.22. The results of an investigation of the nature of this tannin lead the author to the conclusion that it is identical with oak tannin. The article contains a description of the method employed in obtaining the pure tannin, a brief discussion of the use of the bark extract in tanning, and an illustration showing the structure of a section of the bark, as seen under the microscope.

A Contribution to the Knowledge of the Gum from the Oil Tree. By Charles W. Dirmitt. *Am. J. Pharm.*, **70**, 10–18.—A description of the gum is given (taken from *Bull. Botanical Department, Jamaica*, **4**, 77). This is followed by a description of experiments made to fractionate the gum by distillation. Evidently the fractions obtained were the results of decomposition. The analysis of the gum leads the author to the acceptance of the empirical formula $C_{24}H_{40}O_2$. Its iodine number is 46.39 and its saponification equivalent, 15.10.

California and Western Hemlock. By Henry Trimble. *Leather Manufacturer*, **9**, 11.—This article describes the structure of the bark of the Tsuga Mertensiana and a tannin determination in it. There was found 11.37 per cent. tannin in the dry bark, and the analysis of this tannin led the author to conclude that it is identical with a large number of oak tannins.

The Caffein Compound in Kola. Part II. Kolatannin. By J. W. T. Knox and A. B. Prescott. *J. Am. Chem. Soc.*, **20**, 34–75.—A résumé of the literature of oak tannins is given. This is followed by a description of methods employed in obtaining kolatannin, and of its properties, and the analyses of several compounds of it with bromine and acetyl, as well as corresponding anhydrides. A discussion of assay methods is given together with comparative results by several of them, which show that the method of the authors is the best.

SANITARY CHEMISTRY.

E. H. Richards, Reviewer.

Water Supply and Sewerage. By the State Board of Health of Massachusetts (1897). *Ann. Rep.*, **28**, 1–597.—The volume contains the results of the usual monthly examinations of the chief water supplies of the State, together with statistics relating to the experimental filtration of water and sewage.

Report on Food and Drug Inspection. By C. P. Worcester and C. A. Goessmann. *State Board of Health, Mass., Ann. Rep.*, **28**, 601–645.

The City Water Supply. By Adolph Gehrmann and Cass L. Kennicott. *Rep. Dept. of Health of Chicago for 1897*, 175–214.—The averages of the daily examinations during 1896 of samples from the four pumping stations supplying the city were, in parts per 100,000: Free ammonia, 0.0016; albuminoid ammonia, 0.0074; chlorides (not chlorine), 0.63; bacteria, daily average per cc., 6093; per cent. of times pathogenic bacteria were present, 6.30. On October 23, 1896, a series of samples at one-mile intervals was taken off shore for 12 miles.

	Total solids.	Free ammonia.	Albuminoid ammonia.	Bacteria per cc.
One mile.....	14.50	0.0020	0.0140	4000
Twelve miles .	13.00	0.0000	0.0080	520

The highest ammonia was found at three miles; the largest number of bacteria at five miles. A mineral analysis of the water of Lake Michigan is also given.

Sanitary Inspection and Analysis of Ice. By Cass L. Kennicott. *Rep. Dept. of Health of Chicago for 1897*, 215–223.—The method of ice inspection here described must have a marked effect upon the quality of the ice supplied in future. Analyses are given of 61 samples of water from which ice is gathered in the states of Indiana, Illinois, and Wisconsin.

Report of the Rockville Center Laboratory of the Department of Health, Brooklyn. By Hibbert Hill and J. W. Ellms.—This report gives the results and states some of the conclusions arrived at during an investigation into the sanitary condition of the Brooklyn water supply, extending over a period of twelve months, in order that the fluctuations, seasonal and otherwise, might be studied and their significance might be determined. Although forced by causes beyond individual control to prepare their report in haste, the authors have collected considerable information concerning 16 surface supplies and 13 groups of driven wells. A closely approximate figure for the normal chlorine of this region would seem to be about 0.55, which corresponds with that of other regions near the sea. The identification of a species of myrioplyllum (water milfoil) as a probable cause of a fishy odor, and an indicated relation of the number of bacteria to the degree of pollution of ground waters, are points worthy of note. Certain practical suggestions are made as to the improvement of the quality of the several sources.

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Examination of Food Products Collected by the Station. By A. L. WINTON. *Conn. Agr. Expt. Sta. Ann. Rep.*, **21**, 15–63.—It appears that oysters are frequently treated with borax, from 5.5 to 38 grains in a pint of oysters having been found. 27 out of 42 samples of sausages examined contained from 8.4 to 50.4 grains of borax. The total of 11 samples of salt cod-fish examined also contained considerable amounts, as did three samples of cream. A chemical analysis of date stone coffee is given and results of the examination of some 200 samples of milk.

METALLURGICAL CHEMISTRY.

H. O. HOFMAN, REVIEWER.

Matte-Smelting at the Hall Mines, British Columbia. By R. R. HEDLEY. *Eng. Min. J.*, **64**, 695–696.—The paper is an illustrated description of the blast-furnace work done at this smeltery. The furnace, 144 by 44 inches at the tuyere-level, puts through in 24 hours nearly 250 tons charge, producing matte with 49 per cent. copper.

The Highland-Boy Mine and Mill, Bingham, Utah. *Eng. Min. J.*, **64**, 665–666.—The mill which started work in September last, combines pan amalgamating and cyaniding, the coarse gold being recovered from the ore by the former process, the fine gold by the latter.

The Modern Gold Chlorination Process for the Treatment of Gold Ores. By J. E. ROTHWELL. *Min. Sci. Press*, **75**, 573.—A short illustrated description of a chlorinating plant, using the Pearce turret furnace for roasting, and the Rothwell barrel, emphasis being laid more on the practical and economic than on the chemical side of the operations.

Chlorination and Cyaniding. By C. C. BURGER. *Eng. Min. J.*, **64**, 663.—In comparing barrel-chlorination with cyaniding, the author estimates the cost of chemicals per ton of ore to be from 60 to 70 cents for chlorinating and from 30 to 40 cents for cyaniding, but chlorinating has the advantage of requiring less fine-crushing (14 to 16 mesh *vs.* 30 to 40 mesh) and of giving a higher extraction (90–95 *vs.* 80–85 per cent.). Distance from railroad even does not make chlorinating excessively costly; *e. g.*, at Gibbonsville, Ida., the 20 pounds of chemicals required per ton of ore are hauled 100 miles at 1 cent a pound, and make the additional cost of chlorinating only 20 cents.

Cyaniding Sulphide Gold Ores. By R. RECKNAGEL. *Eng. Min. J.*, **64**, 580–581.—A paper very general in its character. Among other things the author calls attention to the fact that

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the gold in some sulphides is soluble, while in others it is insoluble. A very interesting fact is that of iron disulphide; if present as marcasite, it is liable to have a strong decomposing influence upon cyanide, while if present as pyrite this is not likely to be the case, provided, of course, that the sulphide has not been oxidized by atmospheric action. Roasting removes most of the difficulties, if a dead-roast is obtained ; a sulphatizing roast, followed by dissolving out the sulphates with water before using the cyanide solution, gives unsatisfactory results as to consumption of cyanide (some sulphate remaining insoluble in water, but acting upon cyanide) and extraction of gold (some sulphide remaining undecomposed).

Some Products Found in the Hearth of an Old Furnace upon the Dismantling of the Trethellan Tin Works, Cornwall. By W. P. HEADDEN. *Proc. Col. Sci. Soc., Nov. 6, 1897.*—The paper contains a number of elementary chemical and microscopical analyses of the products and deductions as to the rational analyses and the way the products were formed.

Kryolith, Its Mining, Preparation, and Utilization. By W. C. HENDERSON. *J. Franklin Inst.*, **145**, 47–54.—The author discusses briefly the properties of the mineral, the history of its discovery, its occurrence, and the methods of mining, shipping, and conversion into soda and alumina. Two grades are produced, one of which, 99 per cent. pure, goes to Copenhagen, and the other, 92 per cent. pure, to Philadelphia, where the Pennsylvania Salt Co. produces, by the Thomsen process, soda and alumina, the latter serving as raw material for the production of alum. Kryolith is also used as a flux in the electrolytic reduction of alumina and in the production of Kryolith glass.

Direct Recarbonizing of Steel from the Blast-furnace. By C. KIRCKHOFF. *Iron Age*, **60**, No. 23, p. 4.—C. H. Foote, W. R. Walker, and E. A. S. Clarke, of the Illinois Steel Co., have succeeded in using spiegeleisen direct from the blast-furnace in recarbonizing steel, the spiegel being taken from the blast-furnace into a mixer, whence it is poured for neutralizing as needed.

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REVIEW OF AMERICAN CHEMICAL RESEARCH.

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ARTHUR A. NOYES, Editor; HENRY P. TALBOT, Associate Editor.
REVIEWERS: Analytical Chemistry, H. P. Talbot and W. H. Walker; Biological Chemistry, W. R. Whitney; Carbohydrates, G. W. Rolfe; General Chemistry, A. A. Noyes; Geological and Mineralogical Chemistry, W. O. Crosby; Inorganic Chemistry, Henry Fay; Metallurgical Chemistry and Assaying, H. O. Hofman; Organic Chemistry, J. F. Norris; Physical Chemistry, H. M. Goodwin; Sanitary Chemistry, E. H. Richards; Technical Chemistry, A. H. Gill and F. H. Thorp.

INORGANIC CHEMISTRY.

HENRY FAY, REVIEWER.

On the Cuprosammonium Bromides and the Cuprammonium Sulphocyanates. BY THEODORE WILLIAM RICHARDS AND BENJAMIN SHARES MERIGOLD. *Proc. Am. Acad. Arts Sci.*, 33, 131–138.—Cuprosammonium bromide, $Cu_2Br_2,2NH_3$, was prepared by dissolving cuprous bromide in the least possible amount of ammonium hydroxide and acetic acid, and evaporating over sulphuric acid in a current of hydrogen. It crystallizes in long colorless prisms and is extremely easily oxidized. It is soluble in ammonium hydroxide and nitric acid, but deposits cuprous bromide with other mineral acids. Cuprosammonium sulphocyanate, $Cu_2(SCN)_2,2NH_3$, is precipitated as a white crystalline powder when ammonium sulphocyanate is added to an ammoniacal cuprous bromide solution. It loses ammonia at the ordinary temperature. Tetrammon-cuprosammonium bromide, $Cu_2Br_2,(NH_3)_6$, is prepared by placing dry finely powdered cuprous bromide in a bulb tube packed in ice, and passing in dry ammonia gas until the mass is saturated. The compound is a black powder, extremely unstable. Triammon-cuprosammonium sulphocyanate, $Cu_2(SCN)_2,(NH_3)_5$, is prepared in the same manner as the last mentioned salt and is very unstable, giving up ammonia on exposure to the air. The diammon-cupriammonium sulphocyanate, $Cu(SCN)_2(NH_3)_4$, was prepared as brilliant blue crystals, by dissolving cupriammonium bromide in a little acetic acid and adding to this a saturated solution of ammonium sulphocyanate, dissolving the precipitate formed in ammonium hydroxide and allowing it to crystallize.

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Action of Sulphur on Silicides. Production of Silicon. By G. DE CHALMOT. *Am. Chem. J.*, **19**, 871–877.—Sulphur begins to be absorbed by pulverized copper silicide, when heated in closed tubes, at 200°–250° C., and the absorption is complete at 270°–280°. If the temperature is allowed to rise above 300° C. the reaction $Si + S_2 = SiS_2$ takes place; below 300° C. the copper and sulphur react with the liberation of free silicon. Local action sometimes takes place with production of a small amount of silicon sulphide, but the principal reaction is according to the equation $Cu_2Si + S = Cu_2S + Si$. Free silicon is not liberated from manganese, iron or chromium silicides by sulphur.

Solubility of Lead in Ammonia. By H. ENDEMANN. *Am. Chem. J.*, **19**, 890–893.—Lead, when immersed in strong ammonium hydroxide, gradually goes into solution, and after some time the lead becomes covered with a colored coating, the ammonium hydroxide remaining clear and holding in solution after three days' action 0.0139 per cent. of lead. After standing some weeks there is a deposit of hydrated oxide, which contains only a trace of ammonia. Dilute ammonium hydroxide behaves similarly but the separation of hydrated oxide is more rapid. Ammonium bicarbonate does not act upon lead.

A Study of Zinc Hydroxide in Precipitation. By VERNON J. HALL. *Am. Chem. J.*, **19**, 901–912.—To determine the action of substances in solution upon the precipitation of zinc hydroxide, the reaction $ZnCl_2 + 2KOH = Zn(OH)_2 + 2KCl$ was studied, using the same methods as were previously applied by the author to the study of the precipitation of ferric hydroxide (*this Rev.*, **3**, 135). Precipitations of zinc hydroxide from solutions, each containing the same amount of zinc, were made with two, one and one-half, one, and one-half molecules of potassium hydroxide, and the resulting precipitate and filtrate were analyzed. No chlorine was carried down when two molecules of potassium hydroxide were used, but 7.4 per cent. of the total chlorine was present in the precipitate with one and one-half molecules, and the amount decreases as the proportion of potassium hydroxide decreases. With five and eight molecules of potassium hydroxide no chlorine was carried down. In the same manner the reaction $ZnCl_2 + 2KOH + xK_2SO_4 = Zn(OH)_2 + 2KCl + xK_2SO_4$ was studied. No chlorine is found in the precipitate with two or with one and one-half molecules. Sulphur trioxide was not carried down with two molecules of potassium hydroxide; but 12 per cent. was carried down when one and one-half molecules were used. More zinc oxide is carried down in the presence of potassium sulphate than when it is absent. The effect of concentration is to decrease the quantity of

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zinc hydroxide precipitated, and to increase the quantity of chlorine carried down. In the case of iron, there is a tendency to decrease the quantity of ferric hydroxide precipitated and the amount of chlorine carried down. Increase of temperature decreases both the amount of metallic oxide and of chlorine which separates from solution.

On the Effect of Light on the Combination of Hydrogen and Bromine at High Temperatures. By J. H. KASTLE AND W. A. BEATTY. *Am. Chem. J.*, **20**, 159–163.—Hydrogen and bromine in sealed glass bulbs heated to 196° C. in the vapor of boiling *o*-toluidine were exposed to the sunlight for varying times and the extent of the combination was noted by observing the change of color of the free bromine. Combination of the gases was effected in the sunlight, but apparently no change was produced by heating in the dark. The results given are only qualitative.

The Constitution of Arsenopyrite. By F. W. STARKE, H. L. SHOCK AND EDGAR F. SMITH. *J. Am. Chem. Soc.*, **19**, 948–952.—By passing dry hydrogen over arsenopyrite it was shown that all of the sulphur could be removed and only traces of the arsenic. Heating in sealed tubes with copper sulphate showed that arsenious acid was always produced. About 30 per cent. of the iron was shown to be present in the ferrous state and 4 per cent. in the ferric state. The facts established may be represented by the formula $14Fe''As'''S.2Fe'''As'''S$, which the authors regard as tentative only.

Some New Ruthenocyanides and the Double Ferrocyanide of Barium and Potassium. By JAMES LEWIS HOWE AND H. D. CAMPBELL. *J. Am. Chem. Soc.*, **20**, 29–33.—The preparation of strontium ruthenocyanide, $Sr_2Ru(CN)_6.15H_2O$, barium potassium ruthenocyanide, $K_2BaRu(CN)_6.3H_2O$, and barium caesium ruthenocyanide, $Cs_2BaRu(CN)_6.3H_2O$, is described, with a crystallographic comparison of barium potassium ferrocyanide and barium potassium ruthenocyanide. Barium potassium ferrocyanide was found to contain three molecules of water and not five, as stated by Wyrouboff. Barium caesium ferrocyanide, $Cs_2BaFe(CN)_6.3H_2O$, is described.

The Action of Sulphuric Acid on Mercury. By J. R. PITMAN. *J. Am. Chem. Soc.*, **20**, 100–101.—Sulphuric acid was shaken with mercury at intervals during forty-eight hours, in a nitrometer with and without air, and no decomposition of the sulphuric acid could be detected. Excess of mercury or sulphuric acid was without influence.

ORGANIC CHEMISTRY.

J. F. NORRIS, REVIEWER.

Anethol and Its Isomers. BY W. R. ORNDORFF, G. L. TERRASSE, AND D. A. MORTON. *Am. Chem. J.*, **19**, 845–871.—The chemical properties and molecular weights of anethol and its isomers were studied with the following results: Methylchavicol and estragol are identical and are metamers of anethol. Fluid metanethol has the same molecular weight as anethol, and resembles it in physical and chemical properties closely. The two substances are probably stereoisomers, metanethol being the trans compound, $\begin{matrix} HCC.C_6H_4OCH_3(p) \\ \| \\ CH_3CH \end{matrix}$. Anisoïn, the resinous polymeric modification of anethol, acts as a colloid towards the solvents acetic ester, acetone, and benzene. Solid metanethol and the liquid isoanethol have the same molecular weight, which is twice that of anethol. They should be called, therefore, solid and fluid dianethol, respectively. As they both act like saturated compounds, it is possible that they are derivatives of tetramethylene. By heating anethol under pressure to 250°–275° it is transformed into isoanethol, the methyl ester of paracresol, and the methyl ester of parapropylphenol. The author suggests for anethol and its isomers names which are in accord with the new system of nomenclature suggested by the Geneva Conference of Chemists.

Acetylene Diiodide. BY G. DE CHALMOT. *Am. Chem. J.*, **19**, 877–878.—In preparing ethylene tetraiodide by the method of Marquenne (*Bull. Soc. Chim.* [3], **7**, 777) using calcium carbide instead of barium carbide, the author obtained acetylene diiodide as a by-product in the alcoholic washings of the crude tetraiodide. When iodine was added to a solution of acetylene in potassium hydroxide, ethylene tetraiodide was not formed, but a white precipitate, which crystallized from benzene in needles having a very pungent odor. The analogous bromine compound is an oil which takes fire spontaneously in the air. No analyses of the compounds are given.

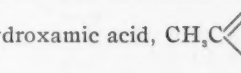
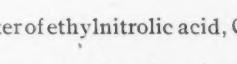
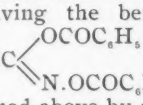
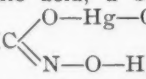
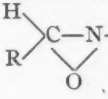
The Action of Sodium upon Methylpropylketone and Acetophenone. BY PAUL C. FREER AND ARTHUR LACHMAN. *Am. Chem. J.*, **19**, 878–890.—Freer has investigated the action of sodium on acetone (*Am. Chem. J.*, **12**, 155; **13**, 319; **15**, 582; **17**, 1) and on acetaldehyde (*Ibid*, **18**, 552; *this Rev.*, **3**, 8) and has shown that the behavior of the salts formed indicates that they have the structures $CH_3C\begin{matrix} ONa \\ \diagdown\!\!\diagup \\ CH_2 \end{matrix}$ and $CH_2{=}CHONa$, re-

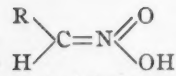
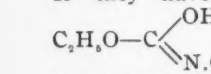
spectively. The present paper contains the results of a study of the action of sodium on methylpropylketone, acetophenone, and mesityl oxide. The method employed was the one introduced during the study of sodium acetaldehyde, namely, the combined action of the ketone and benzoyl chloride upon sodium suspended in ether. When an ethereal solution of methylpropylketone was treated with sodium, hydrogen was evolved, and a white precipitate was formed, which was probably not a definite individual, although the result of an analysis indicated the composition C_8H_9ONa. By the action of a mixture of benzoyl chloride and methylpropylketone on sodium suspended in ether, a number of compounds were formed. These were separated as follows: The ether was shaken with water to remove the yellowish solid formed, and then with dilute alkali. When the combined aqueous extracts were acidified, a large quantity of benzoic acid separated, together with a trace of an undetermined fatty acid, and a solid polyketone. The latter compound is a dibenzoyl derivative, colors ferric chloride intensely red, dissolves in alkalies and carbonates, and has, consequently, the structure $H.C_3H_7CO.C(COC_6H_5)_2$ or $C_3H_7CO.C\begin{matrix}C(OH)C_6H_5\\ \\ COC_6H_5\end{matrix}$.

When the ethereal residue, which contained the main products of the reaction, was distilled under diminished pressure, a large amount of tar was formed. The distillate was repeatedly refractionated without being separated into any definite compounds. From the products of the saponification of the different fractions it was shown that isoketone benzoate, $C_3H_7\begin{matrix}OCOC_6H_5\\ \\ CH_2\end{matrix}$, and methylpropylcarbinolbenzoate were present. All of the fractions contained chlorine, which could not be removed by distillation over sodium or by heating with alcoholic potash. As benzoyl chloride is not an active chlorinating agent, the formation of these halogen compounds is best explained by assuming the addition of the chloride to the sodium derivative of the ketone, and the subsequent elimination of hydrochloric acid, which unites with the unsaturated isoketone benzoate. The experimental results are in accord with this application of Nef's hypothesis. Since from the above it appears that the action of benzoyl chloride upon sodium methylpropylketone is similar to that with sodium acetone, and since the solid dibenzoylketone contains its benzoyl groups attached to methyl, sodium methylpropylketone has the structure $C_3H_7\begin{matrix}ONa\\ \\ CH_2\end{matrix}$. The action of a

mixture of acetophenone and benzoyl chloride on sodium was studied in the way outlined above. From the alkaline extract tribenzoylmethane was obtained, and from the ethereal solution a thick tarry mass, which was shown to contain the benzoate of tribenzoylmethane. A portion of the tar, when saponified by heating with sulphuric acid, yielded benzoic acid, acetophenonepinacone, and a ketone containing halogen, which was not investigated. Acetophenone thus shows the same behavior towards sodium in the presence of benzoyl chloride, as is manifested by acetone and methylpropylketone, with the exception that no isoketone benzoate is formed. It seems, therefore, that as the negative character of the ketone increases the tendency to form O-derivatives decreases. Mesityl oxide forms an unstable sodium compound, which reacts with benzoyl chloride forming a tarry mass which could not be investigated.

On Salts of Nitroparaffins and Acylated Derivatives of Hydroxylamine. By Lauder W. Jones. *Am. Chem. J.*, 20, 1–51.—When benzoyl chloride reacts with sodium isonitroethane the metal is first replaced by benzoyl, and a compound of the following structure is formed: $CH_3—CH=N\overset{O}{\diagdown\!\!\diagup}O—CO.C_6H_5$. This substance cannot be isolated, but is immediately converted by intramolecular oxidation into the benzoyl ester of acethydroxamic acid, which exists in two forms with the probable structures $CH_3C\overset{OH}{\diagdown\!\!\diagup}N—OCOC_6H_5$ and $CH_3C\overset{O}{\diagdown\!\!\diagup}NH.COC_6H_5$. Being a stronger acid than isonitroethane, the hydroxamic ester immediately reacts with the isoparaffin salt, regenerating nitroethane, and forming the sodium salt of the benzoyl ester of acethydroxamic acid, $CH_3C\overset{ONa}{\diagdown\!\!\diagup}NOCOC_6H_5$. In the presence of benzoyl chloride, this salt reacts just as the synthetic salt was found to act, namely, in two ways: by direct replacement forming dibenzoylacethydroxamic ester, and by addition and subsequent elimination of sodium chloride forming α-benzoyl-β-acetylbenzoylhydroxylamine, $\begin{matrix}CH_3CO\\ \\ C_6H_5CO\end{matrix}\!\!\diagup\!\!\diagdown N.OCOC_6H_5$. The formation of the latter compound throws some light on the triacylated hydroxylamine derivatives in general, and is the first experimental evidence in favor of the suggestion that one of the three isomers corresponds to a true hydroxylamine type. By the action of chlorcarbonic ester on sodium isonitroethane, carbon dioxide

and a neutral oil, which could not be purified, were obtained. As it was expected that this reaction would give the carbethoxyl ester of acethydroxamic acid,  , and the carbethoxyl ester of ethylnitrolic acid,  , these substances were prepared and subjected to destructive distillation and the action of a number of reagents. Since the results were identical with those obtained when the above oil was studied in the same way, it is probable that the latter contained the two esters. The action of benzoyl chloride on sodium isonitromethane seems to proceed in two ways, depending on whether the salt is alcohol-free or not. In both cases, however, the chief product is a neutral oil, and the reaction is, in part, analogous to that between benzoyl chloride and sodium isonitroethane. Sodium chloride is eliminated and the resulting product is converted by oxidation into the benzoyl ester of formhydroxamic ester. From this the sodium salt is formed by the decomposition of sodium isonitromethane, and the former then reacts with benzoyl chloride by direct replacement exclusively, giving the benzoyl ester of benzoylformhydroxamic acid,  . The reaction was shown to proceed as outlined above by effecting the synthesis of the sodium salt of formhydroxamic acid and studying its reaction with benzoyl chloride. By the action of mercuric chloride on sodium isonitromethane a mercuric salt is formed which is converted, probably, into a salt of a hydroximic acid. This salt immediately loses water, giving rise to mercuric fulminate. At the same time by the further action of mercuric chloride on the salt of the hydroximic acid, a basic salt is formed with probable structure  . With dilute hydrochloric acid mercuric fulminate is formed. The author comes to the conclusion that the cases of intramolecular oxidation observed in this research, as well as those reported by Nef, cannot be explained on the assumption that the nitroparaffins have the structure proposed by Hantzsch,  . The open formula, however,

 is in accord with all the facts. In the second part of the paper efforts to prepare derivatives of the oxime of carbon dioxide are described. For this purpose the salts and esters of carbethoxyhydroxamic acid were prepared and studied. If they have the formulæ usually assigned to them,  , it seemed possible that they would lose alcohol and thus give rise to the salts of the oxime desired. By the action of methyl iodide on the potassium salt of carbethoxyhydroxamic acid, the methyl ester of the acid and α-methyl-β-methylcarbethoxyhydroxylamine were formed. When decomposed by hydrochloric acid, the former gave α-methylhydroxylamine hydrochloride, and the latter α-dimethylamine hydrochloride. By the action of ethyl iodide on the salt of carbethoxyhydroxamic acid analogous compounds were obtained. The ethyl ester reacted with phosphorus pentachloride; hydrochloric acid and ethyl chloride were evolved, and an oily product was formed which decomposed when poured into water, giving α-ethylhydroxylamine hydrochloride. As it is probable that an ester of the oxime of carbon dioxide was formed in this reaction, it is being studied further. The benzyl and benzoyl esters of carbethoxyhydroxamic acid were prepared, and from the former α-benzylhydroxylamine hydrochloride was formed by decomposition with hydrochloric acid.

The Action of the Halogens on the Aliphatic Amines and the Preparation of their Perhalides. By JAMES F. NORRIS. *Am. Chem. J.*, **20**, 51–64.—The compounds described by Remsen and Norris (*this Rev.*, **2**, 12), formed by the action of bromine and iodine on dimethyl and trimethylamine have been further studied, and it is shown by a number of reactions that the bromides are perhalides containing one added halogen, the trimethylamine compound having the formula $(CH_3)_3NHBr.Br$. The iodine derivative of trimethylamine is a direct addition-product, and has the structure previously assigned to it $(CH_3)_3N.I_2$. By the action of the chlorides of iodine, iodine bromide, and bromine chloride on trimethylamine, perhalides were formed containing two halogens. Analogous compounds were prepared from dimethylamine by the action of the halogens on the salts of the amine. Perbromides of the general structure $R_2NHBr.Br$ were prepared from dimethyl, trimethyl, diethyl, triethyl, dipropyl, tripropyl, and diamylamines. As the number of carbon atoms increased, the stability of the compound and their crystallizing

power decreased. No perbromides of primary amines could be isolated.

On Acylimido Esters. By H. L. Wheeler, P. T. Walden, and H. F. Metcalf. *Am. Chem. J.*, **20**, 64–76. In a previous paper (*this Rev.*, **3**, 60) it was shown that imidomethyl and ethyl benzoates give acyl derivatives with acetyl and benzoyl chloride. The authors have since found that the acylimido esters can also be prepared from the silver salts of the diacyl amides. As silver dibenzamide gave with ethyl iodide a product identical with that obtained from benzimidoethyl ester and benzoyl chloride, the reaction takes place as follows:

$$C_6H_5C\begin{matrix}=NCOC_6H_5\\ \diagdown OAg\end{matrix} + C_2H_5I = C_6H_5C\begin{matrix}=NCOC_6H_5\\ \diagdown OC_2H_5\end{matrix} + AgI.$$

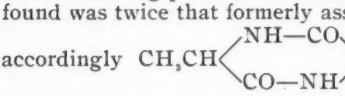
The isomeric nitrogen ethyl compound, $(C_6H_5CO)_2NC_2H_5$, was prepared from ethyl benzamide and found to have properties different from those of the acylimido ester. It is shown by this reaction that the metal in the silver salts of diacyl amides is joined to oxygen and that they have, therefore, structures analogous to those of the silver salts of monoacylamides and anilides. The acylimido esters are very reactive substances: with water, in the presence of acids, they decompose forming either an alcohol and a diacylamide or a monoacylamide and an ester. Acetyl, propionyl, butyryl, carbethoxyl, and benzoylbenzimido esters form diacylamides, while benzoylphenylacetimido ester and those imido esters containing the group $-COCO.OC_2H_5$ give monoacylamides when decomposed by water. These reactions show that diacyl amides have both acyl groups joined to nitrogen. When benzoylbenzimidoethyl ester was heated with benzoyl chloride tribenzamide was formed; when it was heated in a stream of dry ammonia the decomposition-products were phenyl cyanide, phenyl cyanurate, benzamide, and alcohol. Acylamidines were produced by the action of ammonia or bases on the acylimido esters. Acetyl chloride reacts violently with compounds having the grouping $RC\begin{matrix}=NR'\\ \diagdown OR''\end{matrix}$. As this arrangement exists in the formula usually assigned to the trimethyl ester of normal cyanuric acid, its behavior with acetyl chloride was studied. The ester was crystallized from the chloride without change. The following compounds are described: The picrate of benzimidomethyl ester, benzoyl-, carbethoxyl-, and ethyloxalylbenzimidomethyl esters, benzimidoethyl ester mercuric chloride, acetyl-, propionyl-, normal butyryl-, benzoyl-, and ethyloxalylbenzimido ethyl esters, normal butyrylbenzamide, tribenzamide,

ethyldibenzamide, propionylbenzamide, benzimidopropyl ester, acetyl- and benzoylbenzimidopropyl ester, benzoylbenzimidoisobutyl ester, phenylacetimidomethyl ester, and benzoylphenylacetimidoethyl ester.

Note on Double Salts of the Anilides with Cuprous Chloride and Cuprous Bromide. By WILLIAM J. COMSTOCK. *Am. Chem. J.*, **20**, 77–79.—A double salt of the formula $(C_6H_5NH.COCH_3)_2HCl.CuCl$ was formed by cooling a hot solution of acetanilide and cuprous chloride in a mixture of acetic and hydrochloric acids. It crystallizes from alcohol in long, colorless prisms, and is stable in dry air. Analogous bromides containing acetanilide and parabromacetanilide were prepared. Formyl compounds give similar double salts which are very unstable. The salt containing formparatoluide, however, was analyzed and had the formula $(CH_3.C_6H_4NHCHO)_2HBr.2CuBr$.

Action of the Anhydride of Orthosulphobenzoic Acid on Dimethyl- and Diethylaniline. By M. D. SOHON. *Am. Chem. J.*, **20**, 127–129.—Dimethylanilinesulphonphthaleïn was formed by heating a mixture of dimethylaniline, the anhydride of orthosulphobenzoic acid, and phosphorus oxychloride on the water-bath. It forms a blue-black brittle mass, slightly soluble in hot water. The aqueous solution dyes silk and wool bright blue. Phosphorus pentachloride, reducing agents, acetic anhydride, or bromine in glacial acetic acid solution do not affect the phthaleïn. An analogous compound was prepared from diethylaniline.

The Molecular Weight of Lactimide. By G. W. RICHARDSON AND MAXWELL ADAMS. *Am. Chem. J.*, **20**, 129–133.—The molecular weight of lactimide was determined from the lowering of the freezing-point of its solution in acetic acid. The value found was twice that formerly assigned to it and its formula is accordingly



The Action of Sodium Ethylate upon α,β-Dibromhydrocinnamic Ester, Citradibrompyrotartaric Ester, and α,β-Dibrompropionic Ester. By VIRGIL L. LEIGHTON. *Am. Chem. J.*, **20**, 133–148.—A 20 per cent. excess (over 2 molecules) of sodium ethylate in alcoholic solution acts upon α, β-dibromhydrocinnamic ester to form mostly β-ethoxycinnamic ester, with a small quantity of unsymmetrical diethoxyphenylpropionic ester. The ethoxy group was shown to be in the β-position in the former ester by the action of hydrochloric acid which gave benzoylacetic acid. When heated to 110°, β-ethoxycinnamic

ester decomposed into carbon dioxide and acetophenone. From the acid the silver and calcium salts were prepared. Diethoxyphenylpropionic acid could not be obtained from its ester by saponification as it decomposed, forming benzoylacetic acid. A 20 per cent. excess of sodium ethylate acts upon citradibrompyrotartaric ester forming ethoxycitraconic ester and diethoxypyrotartaric ester, which was shown to be a secondary product of the reaction, formed by the action of sodium ethylate on ethoxycitraconic ester. The former reaction-product gave carbon dioxide and propionylformic acid when boiled with a 10 per cent. solution of sulphuric acid. Ethoxycitraconic acid and a number of its salts were prepared. The reactions of the diethoxypyrotartaric ester obtained towards phenylhydrazine, dilute sulphuric and hydrochloric acids are evidence that it has the symmetrical structure. The silver and lead salts of diethoxypyrotartaric are well characterized. From the experiments with α,β-dibrompropionic ester no satisfactory conclusions could be drawn.

On Some Bromine Derivatives of 2,3-Dimethylbutane. By H. L. Wheeler. *Am. Chem. J.*, **20**, 148–153.—A tribrom derivative of 2,3-dimethylbutane could not be prepared from 2,3-dibrom-2,3-dimethylbutane by the action of one molecular quantity of bromine alone or in the presence of iron. In both cases 2,3,K^2,K^3-tetrabrom-2,3-dimethylbutane resulted. As a small amount of impurity has a marked effect on the melting-point of this substance, it is probable that the tetrabromides of 2,3-dimethylbutane already described are identical with the above. One molecular quantity of alcoholic potassium hydroxide gives with the dibromide a mixture of 2,3-dimethyl-1,3-butadiën, $CH_2=C(CH_3)—C(CH_3)=CH_2$ and unchanged bromide. The unsaturated hydrocarbon unites with bromine forming the tetrabromide. 1,2-dibrom-2-methylpropane was prepared by warming isobutyl bromide with iron and the calculated quantity of bromine.

Alkyl Bismuth Iodides and Bismuth Iodides of Vegetable Bases. By Albert B. Prescott. *J. Am. Chem. Soc.*, **20**, 96–100.—The precipitates formed by Dragendorff's reagent for alkaloids (potassium bismuth iodide) in solutions of salts of tetramethylammonium, pyridine, atropine, brucine, and strychnine were analyzed and found to be stable double salts of the general formula $3(\text{Base} + \text{HI}).Bi_2I_6$, with the exception of the tetramethylammonium compound which had the composition $N_3(CH_3)_{11}HBi_2I_7$, and the atropine salt whose formula may be as above or $C_{17}H_{23}NO_3.HI.BiI_3$. It is shown that Dragendorff's reagent has no advantage over that of Mayer in the estimation of alkaloids.

Salts of Dinitro-α-Naphthol with Various Metallic Bases. By T. H. Norton and H. Loewenstein. *J. Am. Chem. Soc.*, **19**, 923–927.—The preparation and properties of the lithium, magnesium, zinc, and copper salts of dinitro-α-naphthol are described. The solubilities of the ammonium and calcium salts in water, alcohol, and ether are also given.

On Certain Amine Derivatives of Dinitro-α-Naphthol and its Chlorination. By T. H. Norton and Irwin J. Smith. *J. Am. Chem. Soc.*, **19**, 927–930.—The trimethylamine, aniline, orthotoluidine, and dimethylaniline salts of dinitro-α-naphthol are described. By the action of chlorine on the dry phenol a substance was obtained which could not be purified but was free from nitrogen.

Carbon Compounds used in Medicine, Classified According to Chemical Structure. By Marston Taylor Bogert. *School of Mines Quart.*, **19**, 47–88.—This is the first paper of a series to be published under the above title. The properties and applications of the methane derivatives used in medicine are described.

MINERALOGICAL AND GEOLOGICAL CHEMISTRY.

W. O. Crosby, Reviewer.

Mineralogical Notes on Cyanite, Zircon, and Anorthite from North Carolina. By J. H. Pratt. *Am. J. Sci.*, **155**, 126–128. These notes are chiefly crystallographic; but a single analysis of the feldspar is given, which identifies it as an anorthite.

Four New Australian Meteorites. By Henry A. Ward. *Am. J. Sci.*, **155**, 135–140.—These are typical siderites; and although representing independent and rather widely separated falls, the analyses disclose a marked uniformity of composition, especially as regards the proportions of iron and nickel.

On Rock Classification. By J. P. Iddings. *J. Geol.*, **6**, 92–111.—This is a general discussion of the principles of rock classification, as applied to the igneous rocks, and with special reference to the chemical composition and relations of the rocks. No fewer than 928 chemical analyses of igneous rocks are compared graphically as regards: first, the silica; second, the ratio between the silica and alkalies; and third, the ratio between the alkalies, potash and soda. These comparisons lead to various interesting results, one of which is that the variations in all of the chemical constituents, other than silica, must increase in proportion as silica decreases; from which it follows that the

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number of different kinds of rocks possible for any given percentage of silica is much greater the lower the percentage of silica. The chemical relations of genetically connected series of rocks are next discussed, and various other topics, the general conclusion being that a systematic classification of all kinds of igneous rocks based, as it should be, upon their material characters, cannot properly be expected to take cognizance also of the laws governing their production, eruption, modes of occurrence, and solidification, as well as their subsequent alteration.

Nodular Granite from Pine Lake, Ontario. By FRANK D. ADAMS. *Bull. Geol. Soc. Am.*, **9**, 163–172.—The nodules, which the author regards as a product of the primary magmatic differentiation of the granite, are composed chiefly of quartz, muscovite, and sillimanite ; and the chief peculiarity which they present lies in the fact that the portion of the magma which thus separated out was more acid than the magma as a whole, which is very unusual. The analyses show that although the granite is a very acid one, the chief difference between it and the nodules is that the latter are richer in silica and alumina and poorer in alkalies than the granite itself.

The Phosphate Deposits of Arkansas. By JOHN C. BRANNER. *Trans. Am. Inst. Min. Eng.*, **26**, 580–598.—This detailed account of these, as yet, unworked deposits is accompanied by numerous analyses of the nodular phosphate rock, the amount of phosphoric acid ranging from 22.62 to 33.86 per cent. Two analyses of the black and green Eureka shales, with which the phosphate rock is invariably associated, are also given.

An Olivinite Dike of the Magnolia District (Colorado) and the Associated Picrotitanite. By MILTON C. WHITAKER. *Proc. Col. Sci. Soc.*, Feb. 5, 1898, 1–14.—Two analyses of this highly altered olivine rock are given, their most striking features being the low percentages of silica (22.24 and 21.90) and the relatively high percentages of magnesia, carbon dioxide, and the alkalies. The secondary and accessory minerals include serpentine, magnetite, picrotitanite, garnet, calcite, chlorite and micas. The picrotitanite or magnesia menaccanite is the most interesting of these, and three analyses of it by different methods are given and discussed.

Phosphatic Chert. By J. H. KASTLE, J. C. W. FRAZER, AND GEO. SULLIVAN. *Am. Chem. J.*, **20**, 153–159.—One of the most characteristic formations in central Kentucky is a deposit of chert which marks the upper boundary of the Trenton limestone. The limestone immediately below the chert is characterized by thin layers which are highly phosphatic, containing

from 1.46 to 31.815 per cent. of phosphoric acid, P_2O_5, the average being about 15.9 per cent.; and this rock is probably the source of the remarkable and enduring fertility of the soil of the Blue Grass section. It has more recently been discovered that the chert itself is invariably phosphatic; and 39 analyses are given, showing from 0.179 to 3.5 per cent. of P_2O_5, with an average of 1.684 per cent. Other analyses are quoted to show that the chert contains four or five times as much P_2O_5 as the normal Trenton limestone or the soils derived from it. Cherts from the Birdseye limestone and from the Permian limestone of Russia were also analyzed and found to contain 0.5 to 3 per cent. of P_2O_5. Other analyses tend to show that the phosphate is an original feature of the chert, while the fact that the porous, weathered cherts are most highly phosphatic suggests that the phosphate may be the insoluble residue of limestone which was once intimately associated with the chert. A chert breccia is also described, the dark-brown cementing substance of which gave in four analyses from 3 to 4.5 per cent. of P_2O_5, which is supposed to exist in the rock as phosphate of iron.

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[CONTRIBUTION FROM THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY.]

REVIEW OF AMERICAN CHEMICAL RESEARCH.

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ARTHUR A. NOYES, Editor; HENRY P. TALBOT, Associate Editor.
REVIEWERS: Analytical Chemistry, H. P. Talbot and W. H. Walker; Biological Chemistry, W. R. Whitney; Carbohydrates, G. W. Rolfe; General Chemistry, A. A. Noyes; Geological and Mineralogical Chemistry, W. O. Crosby; Inorganic Chemistry, Henry Fay; Metallurgical Chemistry and Assaying, H. O. Hofman; Organic Chemistry, J. F. Norris; Physical Chemistry, H. M. Goodwin; Sanitary Chemistry, E. H. Richards; Technical Chemistry, A. H. Gill and F. H. Thorp.

GEOLOGICAL CHEMISTRY.

W. O. CROSBY, REVIEWER.

Geology of Canada. *Ann. Rep. Geol. Survey, Can.*, 7, (1894). —In the section by F. D. Adams on the Laurentian north of the St. Lawrence river, are given the analyses which were made to establish a criterion for the distinction of gneisses of igneous and sedimentary origin. These analyses formed the basis of a separate paper in the *Am. J. Sci.* (July, 1895), which has been reviewed in these pages. Under the head of Economic Resources are also several analyses of iron ores. The section by G. Christian Hoffman, on Chemistry and Mineralogy, consists chiefly of miscellaneous analyses of a large variety of minerals, including coals, iron ores, celestite, graphite, galenite, tetrahedrite, nickeliferous pyrrhotite, marls, mineral waters, and many assays of gold and silver ores.

GENERAL AND PHYSICAL CHEMISTRY.

A. A. NOYES, REVIEWER.

A Revision of the Atomic Weight of Zirconium. BY F. P. VENABLE. *J. Am. Chem. Soc.*, **20**, 119–128.—The ratio $ZrOCl_2 . 3H_2O : ZrO_2$ was determined by heating the former substance at 100° in a current of hydrochloric acid to a constant weight and igniting it, first gently and then to the highest heat of the Bunsen burner for three or four days. The mean value of the atomic weight found is 90.78, that given by Clarke in his report of last year being 90.40. Five sources of error possibly affect-

ing the results are considered by the author. The drying of the hydrated salt seems to the reviewer to introduce another element of uncertainty; for it is almost incredible that a salt which is known to lose water at 180°–210° should not undergo an appreciable loss when heated at 100° for 50–100 hours. It would be desirable to show, at least, that the weight on drying not only became constant, but remained so on long-continued heating.

Fifth Annual Report of the Committee on Atomic Weights. Results Published during 1897. By F. W. Clarke. *J. Am. Chem. Soc.*, **20**, 163–173.—The following is a summary of the atomic weight determinations (referred to oxygen as 16.00) published during last year. The values given by the author in his previous report are also appended in parentheses: Carbon, (Scott, *J. Chem. Soc.*, **71**, 550), 12.0008 (12.01); Carbon, (Lord Rayleigh, *Chem. News*, **76**, 315), 11.9989 (12.01); Nitrogen, (Leduc, *Compt. rend.*, **125**, 299), 14.005 (14.04); Aluminum, (Thomsen, *Ztschr. anorg. Chem.*, **15**, 447), 26.992 (27.11); Nickel, (Richards and Cushman, *Proc. Amer. Acad.*, **33**, 97), 58.69 (58.69); Cobalt, (Richards and Baxter, *Proc. Amer. Acad.*, **33**, 115), 58.99 (58.93); Cerium, (Wyrouboff and Verneuil, *Bull. Soc. Chim.*, **17**, 679), 139.35 (140.2). The article of Scott on carbon related to the application of a correction to the determinations of previous investigators for the change in volume which potash undergoes when it absorbs carbon dioxide. Work has also been done by Hardin (*J. Am. Chem. Soc.*, **19**, 657) on the atomic weight of tungsten, showing the unreliability of the method usually employed.

Investigation of the Theory of Solubility Effect in the Case of Tri-ionic Salts. By Arthur A. Noyes and E. Harold Woodworth. *J. Am. Chem. Soc.*, **20**, 194–201; *Tech. Quart.*, **11**, 65–71.—It was found that the solubility of lead iodide is diminished both by potassium iodide and by lead nitrate in such a way that the product of the concentration of the lead ions into the square of the concentration of the iodine ions remains constant, thus confirming the applicability of the mass-action law to the solubility of tri-ionic salts. The concentration of the saturated solutions was determined by conductivity measurements.

The Relation of the Taste of Acids to their Degree of Dissociation. By Theodore William Richards. *Am. Chem. J.*, **20**, 121–126.—The author finds that he can just detect, by tasting, the acidity of a nearly one-thousandth normal hydrochloric acid solution, and can distinguish weak solutions differing from one another in concentration by 25 per cent.; and he shows that

tenth-normal acid can be titrated with alkali with an error of less than one per cent., using the sense of taste as an indicator of neutrality. The sour taste of different acids was not found to be proportional to their degree of dissociation; for example, a 0.001 normal hydrochloric acid had a taste like that of an acetic acid solution three times as strong, although the concentration of the hydrogen ions in the former solution is about five times as great as in the latter solution. It was further found that, in accordance with the laws of mass-action, sodium acetate greatly diminished the sour taste of acetic acid, though not as much as the theory requires, while potassium chloride has no influence on that of hydrochloric acid.

A Redetermination of the Atomic Weight of Zinc. By H. N. Morse and H. B. Arbuckle. *Am. Chem. J.*, **20**, 195–202.—Richards and Rogers (*Proc. Am. Acad.*, **28**, 200) having shown that an error exists in those atomic weight determinations where zinc oxide has been weighed owing to its occlusion of nitrogen and oxygen, the authors have repeated the earlier determinations of Morse and Burton, using the same sample of pure zinc, and determining the quantities of these gases occluded by dissolving the zinc oxide after weighing, in dilute sulphuric acid, and measuring and analyzing the gas evolved. The mean value of the atomic weight found without correcting for the occluded gases is 65.328; the corrected value is 65.457. The value found by Richards by the analysis of zinc bromide was 65.40.

Ternary Mixtures, III. By Wilder D. Bancroft. *J. Phys. Chem.*, **1**, 760–765.

Molecular Weights of Some Carbon Compounds in Solution. By Clarence L. Speyers. *J. Phys. Chem.*, **1**, 766–783.—The article presents the results of a large number of determinations of the rise in boiling-point produced by various organic substances when dissolved in water, methyl alcohol, ethyl alcohol, propyl alcohol, chloroform, and toluene. These solvents were caused to boil at different temperatures by variation of the external pressure, the main object of the investigation being apparently the determination of the effect of temperature on the molecular raising. No discussion of the results is given, however, nor is any evidence of their accuracy presented, which is particularly unfortunate, since, according to the reviewer's experience, a Beckmann thermometer which is subjected to considerable variations of pressure, may give quite unreliable readings, owing to the imperfect elasticity of the bulb.

Fractional Crystallization. By C. A. Soch. *J. Phys. Chem.*, **2**, 43–50.—The author has made determinations of the solubility in pure water at 25° and at 80° and in forty per cent. alcohol at 25° of four pairs of salts, the solutions being saturated at the same time with both of the two salts. The salt-pairs investigated were potassium and sodium chlorides, potassium chloride and nitrate, sodium chloride and nitrate, and potassium nitrate and sodium chloride. The article contains in addition readily derived formulæ which express the extent to which a mixture of two salts in a solution saturated with them can be separated by definite processes involving on the one hand crystallization by variation of the temperature and the quantity of solvent present, and on the other, precipitation by alcohol at constant temperature.

Distribution of Mercuric Chlorid between Toluene and Water. By Oliver W. Brown. *J. Phys. Chem.*, **2**, 51–52.—It is shown by experiments that mercuric chloride distributes itself between toluene and water in such a manner that the ratio of its concentrations in the two solvents remains nearly, but not completely, constant. The variations from constancy are believed to be greater than would be accounted for by experimental errors.

Solutions of Silicates of the Alkalies. By Louis Kahlenberg and Azariah T. Lincoln. *J. Phys. Chem.*, **2**, 77–90.—The authors have determined the freezing-points and electrical conductivities of dilute solutions of the neutral and acid silicates of the alkali metals. Their experiments confirm the conclusion previously drawn by Kohlrausch in the case of sodium silicate that these salts are to a great extent broken up in solution into colloidal silicic acid and the alkaline hydroxides, this hydrolysis being complete, according to the freezing-point results, when one mol of the neutral salt is present in 48 liters, and amounting to about 65 per cent. at a dilution of 8 liters. The acid salts investigated, $R'HSiO_3$ and $R'_2Si_8O_{11}$, are somewhat less hydrolyzed, as the Law of Mass Action requires. The authors find that the conductivity of the salts is much less than that of the free bases of corresponding concentration, and that that of the acid salts is less than that of the neutral salts; and they appear to attribute these facts, and also the decrease of the conductivity of those salts with the concentration, to a retarding influence of the colloidal silicic acid on the movement of the ions. It seems far more probable, however, that these differences are due mainly, if not wholly, to the fact that the hydrolysis is not complete, and varies in the different cases; for it is not likely that in solutions so dilute as $\frac{1}{16}$ or $\frac{1}{32}$ normal the dissolved substance, whatever its nature, appreciably affects the rate of movement of the ions.

Vapor-tension of Concentrated Hydrochloric Acid Solutions. By F. B. ALLAN. *J. Phys. Chem.*, **2**, 120–124.—The partial pressure of hydrochloric acid over its solutions containing from 28.1 to 36.4 per cent. acid was determined by drawing measured quantities of air through them, absorbing the gas in water, and titrating. Between these comparatively narrow limits of concentration the partial pressure of the acid was found to vary from 5.5 to 138.1 mm. of mercury, so that the variation cannot possibly be accounted for by the change in dissociation of the acid.

H. M. GOODWIN, REVIEWER.

A New Form of Discharger for Spark Spectra of Solutions. By L. M. DENNIS. *J. Am. Chem. Soc.*, **20**, 1–3.—This device avoids the difficulty usually met with in observing spectra of this kind, namely, spattering and rapid consumption of the solution. It consists of a U-shaped tube of unequal arms, in the shorter of which the lower sparking terminal—a cone of graphite—projects upward, being sealed in from below by means of a platinum wire. The solution is fed to this electrode from the longer arm by the following device: a somewhat smaller straight glass tube which telescopes air-tight through the open end of the longer arm, by means of a rubber connector, is pressed down into the solution until its lower end is at a level with the cone in the shorter arm. As the solution evaporates at the electrode, air enters the longer arm through this tube until the same level of liquid is reestablished in both arms.

A Method of Determining the Resistance of Electrolytes. By PARKER C. MCILHINEY. *J. Am. Chem. Soc.*, **20**, 206–208.—The method described lays no claim to the degree of accuracy attainable with the usual Kohlrausch method and is of advantage mainly when a large number of resistance measurements are to be made in a short interval of time. It was devised to measure the resistance of silicates and similar electrolytes at high temperatures. The method consists in connecting a known adjustable resistance R, in series with the conductivity cell of resistance X, with a battery of constant electromotive force. A rapidly revolving current reverser is inserted in the circuit between the known resistance and the cell, to avoid polarization and electrolysis in the latter. The fall of potential through the known resistance R is measured by means of a D'Arsonval galvanometer. If R is made small compared with X, the drop of potential through R is approximately proportional to the conductivity of the cell. Formula (5) should be corrected as follows: $f : g = X : R$.

The Jacques Cell. By Wm. Ostwald. *Am. Electrician*, 10, 16–17.—In this letter to the *Electrician* Ostwald has clearly indicated the probable actions taking place in the Jacques carbon cell, by pointing out its analogy to the Lalande cell, the latter consisting of copper oxide and zinc electrodes in sodium hydrate. On closed circuit the zinc dissolves to sodium zincate, while the cuprous oxide is reduced to metallic copper. The continuous action of the cell requires the reoxidation of the reduced copper by air or oxygen. In the Jacques cell the copper oxide is replaced by iron, which in presence of the free oxygen blown in at the high temperature used, is oxidized to ferric oxide, and the zinc by carbon. The action of the cell consists in the oxidation of the carbon anode to carbonic acid and reduction of the ferric oxide. Oxygen must be supplied at the cathode in order to maintain the action of the cell. The chemical potential of free oxygen is therefore not effective in producing electrical energy in this cell, but only that of ferric oxide. The thermoelectric explanation of Reed is regarded as wholly unfounded.

The Surface-tensions of Aqueous Solutions of Oxalic, Tartaric, and Citric Acids. By C. E. Linebarger. *J. Am. Chem. Soc.*, 20, 128–130.—The surface-tensions of aqueous solutions of the three above-mentioned acids was determined at 17.5°, 15° and 15°, respectively, for various concentrations, with the apparatus devised by the author and previously reviewed (*this Rev.* 2, 38). It was found that the surface-tension of oxalic and citric acid solutions rapidly diminished with increasing concentration, whereas the values for tartaric acid increased. For solutions of citric acid varying in concentration between thirty-five and sixty-five per cent. the surface-tension was nearly constant. No attempt was made to explain the results obtained other than to ascribe them to complicated relations resulting from polymerization and dissociation phenomena.

The Vapor-pressure Method of Determining Molecular Weights. By W. R. Orndorff and H. G. Carrell. *J. Phys. Chem.*, 1, 753–760.—This is a preliminary communication on the application of Ostwald's method of determining the vapor-pressure of solutions as worked out by Bredig and Will, to molecular weight determinations. As no essential modifications have been made in the method and as the results published clearly indicate the preliminary nature of the experiments thus far made, a more detailed review may be reserved for a later communication.

Solubility and Boiling-point. By Oliver W. Brown. *J. Phys. Chem.*, 1, 784–786.—The addition of potassium chloride to

an aqueous alcoholic solution was found to lower its boiling-point, as already shown by Miller, whereas the addition of a substance which is soluble both in alcohol and water, as urea, was found, as expected, to produce a less anomalous result. The boiling-point was in fact found to rise, but less than in simple aqueous solutions. The experiments are to be continued with alcoholic solutions of different percentage composition.

On the General Problem of Chemical Statics. By P. Duhem. *J. Phys. Chem.*, **2**, 1-43; 91-116.—This paper is, as the author states, intended to be a commentary on and complimentary to Gibbs' memoir "On the Equilibrium of Heterogeneous Substances." On account of its mathematical nature it does not admit of a detailed review. The subject is treated with the author's usual elegance and should be read by all interested in the application of thermodynamics to chemical equilibrium. The following subdivisions of the paper will indicate its general scope and contents. The preliminary chapter treats of the thermodynamic potential of an homogeneous mixture under constant pressure and under constant volume. Chapter 1 deals with general theorems of the chemical statics of homogeneous systems, both at constant pressure and at constant volume; Chapter 2 deals with heterogeneous systems at constant pressures and contains a deduction of the phase rule and an application of it to systems of different variance. The concluding chapter has to do with the general principles of the equilibrium of heterogeneous systems at constant volume, and the more especial discussion of systems of different variance, and under certain prescribed external conditions.

Correction. By Wilder D. Bancroft. *J. Phys. Chem.*, **1**, 786.—The fact that lead iodide crystallizes in the anhydrous form from aqueous solutions, instead of with two molecules of water as assumed by the author, renders valueless his conclusions relative to this salt in his paper on solids and vapors (*J Phys. Chem.*, **1**, 344).

ANALYTICAL CHEMISTRY.

ULTIMATE ANALYSIS.

H. P. Talbot, Reviewer.

The Dignity of Analytical Chemistry. By C. B. Dudley. *J. Am. Chem. Soc.*, **20**, 81-96.—In this paper (his presidential address), Dr. Dudley has clearly and forcibly stated the claims which Analytical Chemistry may justly put forward for a position of equality with other branches of the science. The article does not admit of a brief review.

XUM

Sodium Peroxide in Quantitative Analysis. By C. GLASER. *J. Am. Chem. Soc.*, **20**, 130–133.—The paper reviews the published statements regarding the quantitative use of sodium peroxide, and the author details a procedure involving its successful use in the determination of sulphur in coal, coke, and asphalt.

The Volumetric Determination of Cobalt. By HARRY B. HARRIS. *J. Am. Chem. Soc.*, **20**, 173–185.—A critical examination of the various published volumetric methods for the determination of cobalt has been attempted, from which the author concludes that "after careful repetition of these methods, making varying conditions whenever deemed advisable, one is justified in concluding that none of them possess the degree of accuracy required in any trustworthy determination of cobalt. A good volumetric method for this purpose still remains to be devised." No suggestions are offered to assist the future investigator.

W. H. WALKER, REVIEWER.

The Estimation of Manganese as Sulphate and as the Oxide. By F. A. GOOCH AND MARTHA AUSTIN. *Am. J. Sci.*, **155**, 209–214.—The estimation of manganese in its salts when combined with volatile acids, by weighing as the anhydrous sulphate, is found, contrary to previous investigations, to be both rapid and accurate. The difficulty in obtaining a manganese solution of known strength, owing to the varying degrees of hydration of the manganous salts, was overcome by preparing a perfectly neutral solution of manganous chloride, and from the weight of silver chloride obtained from a definite volume, the weight of manganese present was calculated. Portions of this solution were evaporated to dryness in the presence of sulphuric acid, and the excess of acid driven off by heating the residue in a platinum crucible suspended in a larger porcelain crucible used as a radiator. This outer crucible may be heated to dull redness, and the residue thus ignited to constant weight. The results show the process to be both simple and accurate. The estimation of manganese by weighing as the different oxides is described, but found by experiment to be far less satisfactory than the method just outlined.

XUM

[CONTRIBUTION FROM THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY.]

REVIEW OF AMERICAN CHEMICAL RESEARCH.

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ARTHUR A. NOYES, Editor; HENRY P. TALBOT, Associate Editor.
REVIEWERS: Analytical Chemistry, H. P. Talbot and W. H. Walker; Biological Chemistry, W. R. Whitney; Carbohydrates, G. W. Rolfe; General Chemistry, A. A. Noyes; Geological and Mineralogical Chemistry, W. O. Crosby; Inorganic Chemistry, Henry Fay; Metallurgical Chemistry and Assaying, H. O. Hofman; Organic Chemistry, J. F. Norris; Physical Chemistry, H. M. Goodwin; Sanitary Chemistry, E. H. Richards; Technical Chemistry, A. H. Gill and F. H. Thorp.

ANALYTICAL CHEMISTRY.

PROXIMATE ANALYSIS.

A. H. GILL, REVIEWER.

A Delicate Test for the Detection of a Yellow Azo Dye used for the Artificial Coloring of Fats, etc. BY J. F. GEISLER. *J. Am. Chem. Soc.*, **20**, 110.—The test consists in adding a small quantity of Fuller's earth to the fat, placed in a porcelain dish. A pink or violet color is produced if the dye is present. The test will detect 14 grains per ton or 1 part per million with ease, and may be used to indicate 0.000000005 mg. of the dye.

Method of Testing Spirits of Turpentine. BY C. B. DUDLEY AND F. N. PEASE. *Am. Eng., Car Builder and R. R. J.*, **72**, 119.—The four tests employed are: Specific gravity, distillation-point, residue on evaporation, and treatment with oil of vitriol. The gravity is determined by the Westphal balance and varies from 0.862 to 0.872. The distillation-point is determined by boiling 100 cc. in a 500 cc. distillation flask. This point varies from 305° to 308° F. (152°–153° C.) at 29 inches pressure, with the thermometer wholly in the vapor. For the residue on evaporation, 20 grams of the sample are weighed into a 100 cc. platinum dish and evaporated not above 250° F. (121° C.). The residue should not exceed 2 per cent. and usually does not exceed one. The evaporation should take place at 100° C. in cases of dispute. The treatment with oil of vitriol is based upon the fact that pure oil of turpentine is almost wholly polymerized and dissolved by sulphuric acid. Six cc. of the sample are placed in a 30 cc. tube graduated to tenths, held under a cold water faucet and slowly filled with C. P. sulphuric acid. It is allowed to cool, the tube corked, and the contents mixed five or six times, cooling

if necessary. The tube is placed vertically and allowed to stand half an hour. The material unaffected by the acid is the adulterant and its volume is measured. It is not usually more than 3 per cent.

G. W. ROLFE, REVIEWER.

The Lecithins of Sugar-cane. BY EDMUND C. SHOREY. *J. Am. Chem. Soc.*, **20**, 113–118.—The paper presents a discussion of the determination of lecithins in sugar-cane juice as well as the limitations of the present analytical methods for separating these bodies from other nitrogen compounds present. The author suggests that the greasy deposits in the higher vacuum cells of multiple effects of sugar houses result in part from the decomposition of lecithins.

Comparison of the Standard Methods for the Estimation of Starch. BY H. W. WILEY AND W. H. KRUG. *J. Am. Chem. Soc.*, **20**, 253–266.—A large amount of experimental data is given which proves that all the existing polarimetric methods for determining starch are unreliable. The Lindet method is only approximate. The diastase method gives satisfactory results providing precautions are taken to pulverize the sample to extreme fineness and allow sufficient time for the action of malt, preferably containing pepsin. It is recommended to remove the fat first and also to repeat the malt treatment after boiling and cooling. While noting that the results of cereal analyses are at best but approximate, the authors do not believe that any constituents are present that are unaccounted for unless amounts of complex carbohydrates so small as to be reasonably negligible.

The Solubility of the Pentoses in the Reagents Employed in the Estimation of Starch. BY W. H. KRUG AND H. W. WILEY. *J. Am. Chem. Soc.*, **20**, 266–268.—The authors show by analyses that the solution of the pentosans by malt extract is inappreciable. Incidentally, they point out the important fact that hexose carbohydrates give a noticeable amount of furfurol when distilled with 12 per cent. hydrochloric acid. This, it would seem, might have an important bearing on many "pentosan" determinations.

Note on Fehling's Solution. BY J. B. TINGLE. *Am. Chem. J.*, **20**, 126–127.—The author recommends the Pavy solution, modified by Purdy, in which the tartrate is replaced by glycerol. The composition is given of the solution which is especially designed for urine analysis.

W. R. WHITNEY, REVIEWER.

A Simple and Accurate Method of Testing Diastatic Substances. BY JOKICHI TAKAMINE. *Am. J. Pharm.*, **70**, 141–

143.—This is apparently a rapid method of procedure, based on the assumption that taka-diastase does not lose its diastatic power on standing, as do other forms of this ferment. The diastatic action of the material to be measured is compared with the action of the taka-diastase, the actual comparison being made between the color produced by iodine in starch paste hydrolyzed by the sample ferment and shades, or colors, produced when taka-diastase is used.

Vinegar Analysis and Some Characteristics of Pure Cider Vinegar. By Albert W. Smith. *J. Am. Chem. Soc.*, **20**, 3–9.—Beside the methods of analysis, this article also states the results of analyses of over fifty different samples of vinegar, the acid, total solids, ash, alkalinity of ash, and the soluble and insoluble P_2O_5 of the ash being given. From these results interesting conclusions are drawn as to differences between pure cider vinegar and other varieties.

Method of Analysis of Licorice Mass. By Alfred Mellor. *Am. J. Pharm.*, **70**, 136–137.—This is an outline of the methods adopted by consumers and manufacturers in the United States. Moisture, mineral matter, insoluble matter (in cold water), gummy matter, glycyrrhizin, saccharine matter, and extractive substances are determined.

Glucose in Butter. By C. A. Crampton. *J. Am. Chem. Soc.*, **20**, 201–207.—In preparing butter for transportation into warm climates it is sometimes the practice to mix glucose with the salted butter. The author has determined the quantities of glucose in different samples "by difference" and by direct methods; *i. e.*, by the use of Fehling's solution and by the optical method. The percentage of glucose found in the samples varies from 5 to 13 per cent. calculated as confectioner's glucose (16.5 per cent. water).

Methods and Solvents for Estimating the Elements of Plant Food Probably Available in Soils. By Walter Maxwell. *J. Am. Chem. Soc.*, **20**, 107–110.—A preliminary publication, to be followed later by descriptions of experiments carried on in Hawaii.

The Determination of Small Quantities of Alcohol. By Francis G. Benedict and R. S. Norris. *J. Am. Chem. Soc.*, **20**, 293–302.—The method is based on the oxidation of alcohol by chromic acid, and presupposes the absence of other reducing agents in the alcoholic solution. The result of an analysis of a solution containing 0.00494 per cent. of alcohol varied by but 0.03 of this amount. With solutions ten times as

concentrated the agreement was exact. The paper contains interesting information concerning the absorption of alcohol from air by sulphuric acid.

On the Assay of Belladonna Plasters and the Alkaloidal Strength of the Belladonna Plasters of the Market. By Carl E. Smith. *Am. J. Pharm.*, 70, 182–189.—This is a report of the Research Committee D, Section II of the Committee of Revision of the U. S. Pharmacopœia. It contains a detailed method of analysis, as well as the results of analyses of ten plasters of American and one of foreign make.

Analysis of the Rhizome and Rootlets of Plantago Major, Linne. By J. Frank Strawinski. *Am. J. Pharm.*, 70, 189–191.—The drug was successively extracted with petroleum ether, ethyl ether, absolute alcohol, and water, and these extracts examined. A crystallizable material was found in the petroleum ether extract, which the author hopes to study further. No glucosides or alkaloids were found in the residue resulting from the ether extract. Glucose and saccharose were found in the alcohol extract. Starch was found, but no tannin. The ash, amounting to 24.7 per cent. of the weight of the drug, was found to contain the ingredients usually found in plant ashes.

Criticism of a Proposed Method for the Assay of Senega. By Edward Kremers and Martha M. James. *Pharm. Rev.*, 16, 45–49.—The authors show that the fact that methyl salicylate may be obtained from most samples of senega root by distillation with steam, is not a satisfactory criterion in testing for this drug. Samples known to have been false senega yielded the salicylate, while some true senegas did not. The authors point out the fact that addition of acid in the distillation increases the yield of methyl salicylate, which is evidence that this ester is a product of hydrolysis, perhaps of a glucoside.

Test for Hydrocyanic Acid in Mitchella Repens. By Richard Fischer. *Pharm. Rev.*, 16, 98–99.—The author failed to find this acid in samples of the partridge berry or squaw vine examined by him. The search was prompted by the report that hydrocyanic acid occurs in this plant.

F. H. Thorp, Reviewer.

A Method of Estimating Tannin. By J. N. Hurty. *Leather Manufacturer*, 9, 10.—A ten per cent. solution of the extract is made by dissolving the requisite quantity in 500 cc. boiling water, and, after cooling, diluting with the proper amount of water. After mixing, two samples of 100 cc. each are evaporated on a

steam-bath in aluminum dishes, weighed, and the average of weight taken as the total solids. The remainder of the solution is filtered on S. & S. No. 597 paper and the first 100 cc. of the filtrate rejected. Two more samples, each of 100 cc. are evaporated as before and the average of the weighings subtracted from the total solids. The difference is the insoluble matter. Two more 100 cc. samples are run upon two 10 gram portions of hide powder in 100 cc. beakers, well stirred and allowed to stand five minutes; they are then put into glass percolators stoppered with absorbent cotton. The turbid and colored percolates are thrown away and the wet hide powder packed by pressing with a large glass rod. New portions of the filtered extract are then poured through the percolators and 5 cc. portions of the clear liquid are collected and tested with the original filtered extract for soluble hide. If no soluble hide is found, 105 cc. of each percolate is reserved and then 5 cc. more is collected and tested for tannin by adding a few drops of soluble hide solution. If both tannin and soluble hide are absent in the percolates, 100 cc. of the reserved portions are evaporated as before and the average of the weights taken as non-tannins. This weight is subtracted from the total solids from the filtered extract solution and the difference called tannin. The method is claimed to be more rapid than the official "shake process." Several misprints make the directions somewhat obscure.

Testing of Formaldehyde. By Carl E. Smith. *Am. J. Pharm.*, **70**, 86.—The author has studied numerous methods of assaying formaldehyde with the view of finding a simple, rapid, and reasonably accurate process for use by manufacturers and pharmacists. It is necessary that common impurities, such as acetone and methyl alcohol shall not affect the accuracy of the process. The hydroxylamine method of Brochet and Cambier (*Compt. rend.*, **120**, 489) is quick and accurate with pure solutions, but other aldehydes and acetones interfere with its exactness. The iodine method (Romijn, *Ztsch. f. anal. Chem.*, **36**, 18) is unsuitable if acetone is present. The cyanide method of Romijn (*ibid.*) requires much care and attention and will only give satisfactory results in practiced hands. The free alkali method consists in heating formaldehyde with sodium or potassium hydrate solution under pressure, in a manner similar to that in the saponification of esters, converting the formaldehyde into methyl alcohol and formic acid. The results are reasonably exact in all but one case, but methyl alcohol and acetone interfere with the result, and there is some danger of an explosion. One anomalous case was observed, but could not be explained. The ammonia method (Legler, *Ber.*, **16**, 1333) was found reliable if care was taken to standardize the ammonia solution fre-

quently and to titrate the contents of the flask soon after admixture with the ammonia. Methyl alcohol and acetone have practically no influence. The inaccuracy caused by the loss of ammonia led the author to modify the process as follows: Dissolve two grams of pure neutral ammonium chloride in 25 cc. of water and put into a flask provided with a well-fitting stopper. Add 2.25 grams of the sample and run in from a burette 25 cc. of $\frac{n}{1}$ potassium (or sodium) hydrate. Stopper the flask at once and let stand one-half hour. Then add a few drops of rosolic acid solution and determine the excess of ammonia with $\frac{n}{1}$ sulphuric acid, each cc. $\frac{n}{1}$ potassium hydrate consumed indicating 0.5 per cent. of formaldehyde. A series of tests on commercial samples is tabulated and a list of tests to be followed in the examination of them, together with the precautions to be observed, is given.

TECHNICAL CHEMISTRY.

A. H. GILL, REVIEWER.

Alabama Coal in By-product Ovens. BY W. B. PHILLIPS. *Am. Manuf.*, 17, 446.—The paper gives the results of coking washed coal from the Pratt seam in Otto–Hoffman ovens at Jefferson Co., Alabama. Four different runs of about 7 tons each were made. The results are as follows:

	Analysis.	
	Coal.	Coke.
Moisture	5.95	dry
Volatile matter	32.69	0.98
Fixed carbon	54.33	90.22
Ash	7.03	8.80
Sulphur	0.94	1.28

Yield of gas 9600 cu. ft. per ton; heating power 630 B.T.U. per cu. ft.; candle power 11.4; coke 70.6 per cent.; tar 90 lbs. per ton; sulphate of ammonia 23.6 lbs. per ton; about 3000 cu. ft. of gas per ton are available.

The Explosive Properties of Acetylene. BY F. C. PHILLIPS. *Proc. Eng. Soc. Western Pa.*, 13, 299.

G. W. ROLFE, REVIEWER.

Additional Notes on the Sugar-cane Amid. BY EDMUND C. SHOREY. *J. Am. Chem. Soc.*, 20, 133, 137.—The author gives further experimental evidence that the amid described in a previous paper (*this Rev.*, 4, 34) is glycocoll containing a trace of leucine.

Making Concrete in Multiple Effects. BY L. M. SONIAT. *La. Planter and Sugar Mfr.*, 20, 248.—This is an account of experiments with the Lillie triple-effect in boiling clarified juice

directly to concrete. In order to give the requisite hardening temperature the juice was run "backwards;" *i. e.*, from the highest to the lowest vacuum-cell. The author believes that this process will prove a distinct economy over working centrifugal sugars especially where transportation rates are high. The steam saving is also thought to be considerable. An analysis of the concrete is given.

The Manufacture of Concrete in the Multiple Effect. By S. M. LILLIE. *La. Planter and Sugar Mfr.*, **20**, 248–251.—This paper offers a further treatment of the subject on similar lines. A short history of the manufacture of concrete, and statistics as to the profits in this work as carried on twenty years ago are given, as well as analyses. The vital point of the probable influence of this industry on the sugar market is also discussed.

The Cambray Process of Double Sulphuring. By G. CAMBRAY. *La. Planter and Sugar Mfr.*, **20**, 203.—A series of analyses are given of mill juices and clarified syrups of El Puente Sugar House, showing an average increase of quotient of purity from 82.87 to 91.20 by this method of clarification.

Sugar Beet Investigations in Wisconsin during 1897. *Bull. Agr. Sta. Univ. of Wis.*, **64**, 3–104. **Sugar Beets in South Dakota.** *Bull. U. S. Expt. Sta., So. Dakota*, **56**, 3–32. **Sugar Beet Investigations.** *Bull. Cornell Univ. Agr. Expt. Sta.*, **143**, 493–574. **The Sugar Beet in Illinois.** *Univ. of Ill. Agr. Expt. Sta.*, **49**, 1–52. **The Composition and Production of Sugar-Beets.** By L. L. VAN SLYKE, W. H. JORDAN AND G. W. CHURCHILL. *Bull. N. Y. Agr. Expt. Sta.*, **135**, 543–572.—These bulletins give evidence of the continually growing interest in this subject. In the main they deal with experiments in cultivation. Besides giving the results of analytical examinations of experimental crops, they are excellent manuals of beet culture.

F. H. THORP, REVIEWER.

Paints, Painting Materials and Miscellaneous Analyses. By H. H. HARRINGTON AND P. S. TILSON. *Bull. No. 44, Texas Agr. Expt. Sta., 1898.*—The chief matter of interest in this bulletin is an investigation of the value of cottonseed oil to be used for paint as a cheap preservative for outside work. Tests of the drying properties of the oil were made with a view to its use instead of linseed oil. Two methods of testing were used: (A) Boiling the oil with different drying agents in order to increase its drying properties. (B) Treating the oil with gasoline or turpentine. Seventeen experiments were made under (A) using borate of manganese, chloride of lime, black oxide of

manganese (MnO_2?), nitrous acid, caustic soda, lead acetate and various mixtures of these substances. The time and temperature of the heating were varied. The prepared oils were mixed and ground with a good quality of "white lead," and the paint thus made applied to pine boards and dried in the sun. The best result was obtained with an oil which had been heated to 170° C. for one hour, with 0.3 per cent. of manganese borate. This paint dried in six and a half hours. The next best paint was made with an oil which was heated forty-five minutes to 70° C. with 1 per cent. of sodium hydroxide and then treated with 2.5 per cent. of lead oxide, and heated several (?) hours from 130° to 170° C. This sample, as well as several others, also dried in six and a half hours. But in all cases, the films obtained were less hard and firm than those yielded by linseed oil. Many of the samples required two, six, and even eight days for drying, while others were entirely useless. The oils tested with turpentine and gasoline were less satisfactory. One sample, mixed with 10 parts turpentine, dried in eight and a half hours, giving a fair paint. As a rule, cottonseed oil affords less gloss and hardness in the film, but somewhat more tenacity than linseed oil. The conclusion reached is that a properly made cottonseed oil may well replace linseed paints for cheap outdoor work. It is also suggested that the boiling of the oil might be done by "anyone;" but in the opinion of the reviewer, this statement might well have been omitted, since if left to the care of an inexperienced person, the kettle is almost certain to boil over. The authors also devote some space to discussion of the tabulated analyses of thirteen commercial paints. One "pure white lead" consisted of 66.79 per cent. barytes ($BaSO_4$), 15.59 per cent. zinc oxide and 9.81 per cent. "white lead." Another contained 74.5 per cent. barytes. They also find that red and yellow ochres are most suitable for general use with crude cottonseed oil, but with well prepared "boiled" oil, it may pay to use the best white lead or white zinc. The remainder of the bulletin is devoted to tabulated analyses of mineral waters (36 samples) cottonseed meal, coals, clays, fertilizers, asphalts, ashes, ores, and a lignite tar distillate.

Estimation of Mineral Matter in Rubber Goods. By L. de Koningh. *J. Am. Chem. Soc.*, **19**, 952.—This is a method designed to remove all the soluble mineral matter by treating the rubber with fuming hydrochloric acid. The rubber plus the insoluble matter is weighed, and the ash determined by ignition as usual. The acid filtrate may then be analyzed separately.

The Semet-Solvay Coke Oven and its Products. By William H. Blauvelt. *Proc. of the Ala. Industrial and Scien-*

tific Soc., 7, 33.—This is a general description of the Semet-Solvay oven as erected at Ensley, Ala., and a discussion of the properties of the coke, gas, ammonia and tar obtained from it. The usual charge is 4½ tons, and the time of coking is about 24 hours; the time of discharging and charging is about 15 minutes. The amount of gas varies from eight to ten thousand cubic feet per ton of 2000 pounds. The heat utilization is very perfect. The gases from the retort are cooled and passed through scrubbers and condensers to remove ammonia and tar; a part of the gas is then burned with air to heat the retorts and the boilers, supplying steam for operating the plant; the remainder is available for lighting, or other heating purposes. In the retort oven the coking takes place without access of air, and a certain amount of the hydrocarbons distil off, are broken down, and some graphitic carbon is deposited on the coke. This increases the yield of coke over that obtained from the bee-hive oven, into which some air enters, so that the hydrocarbons are largely burned in the oven itself, together with a portion of the coke. In a bee-hive oven with Connellsville coal, yields of 65 per cent. coke are considered good; but from the retort oven 75 per cent. coke is obtained. In the bee-hive the coal lies in a layer about 24 inches deep, over a broad surface; the bottom of the oven being cold, from the quenching of the previous charge and contact with new coal, the coking begins at the top and extends downward, the coke swells and develops the characteristic cellular structure. This texture is thus entirely beyond control and dependent upon the character of the coal; hence many coals do not yield a good coke in the bee-hive oven. In the retort oven, the charge lies in a tall narrow mass, about 5 feet high by 20 inches wide, while the retort, having been quickly emptied by mechanical means and recharged while very hot, the coking and distillation begins at once and the gases formed at each side, penetrate to the center of the mass, where they meet and rise to the top; thus a cleavage plane is formed midway between the walls. The coke in contact with the hot wall is denser, and that in the center more spongy than the main mass. The cellular structure is more compressed, since the narrow retort allows no expansion in the direction of the flow of the gases and because of the depth of the charge. The cellular structure depends somewhat upon the size of the oven, the temperature, and the time of coking. Owing to the rapid heating of the charge, coals may be coked in these ovens which cannot be used in the bee-hive form, since the bituminous matters are decomposed before they can escape. Tests have been made with retort and with bee-hive cokes, both produced from Connelsville coal, during a year's running of a blast-furnace, the fuel charge being changed at times from all

retort coke to all bee-hive coke, or to a mixture of both, and yet no indications of difference in the fuel was observed in the working of the furnace. It is not claimed that the retort product is superior to the Connelsville bee-hive coke, but that certain other coals, which are unfit for bee-hive coking, will yield a fair product when coked in retorts; even from impure coal a coke good enough for brewers, malsters or domestic uses, may be made. The retort coke is harder and is thought to withstand the exposure to the furnace gases in the upper part of the furnace better than bee-hive coke; but it has not the silvery luster or glaze of the latter, and is sometimes too wet, owing to improper quenching after drawing. The effect of moisture in the coke is not decided, but tests have been made indicating that it protects the coke from the furnace gases by its cooling action, and by thus allowing more fuel to reach the zone of fusion, should decrease the fuel consumption. It is shown that chemical analysis is of little value in indicating the coking power of coal. But a method devised by Louis Campredon and used in the Vignac Works, in France, is explained. Weighed portions of the finely powdered coal are mixed with varying quantities of sand and the mixtures heated to red heat in closed crucibles until the coal is carbonized. When cold, a powdery or more or less coked mass is left; from the test portion showing the maximum quantity of sand that the coal can bind together, the coking qualities are estimated; the weight of the coal being unity, the binding power is shown by the weight of agglomerated sand. The most binding coal tried was found equal to 17, while pitch showed a power of 20.—The ammonia is given off most rapidly about ten hours after charging but ceases entirely before the coking is complete, leaving in the coke about one-quarter of the nitrogen originally in the coal. The yield of ammonia is calculated as sulphate and from Pittsburg coal averages about 16 to 22 pounds per ton of coal. The tar is of good quality and owing to the increased manufacture of water gas, it now finds a ready market. The yield of tar from Pittsburg coal varies from 70 to 80 pounds per ton. The by-product oven gas will probably have to be used as fuel, since it contains less illuminants than that from gas-house retorts; but from good gas coal it would furnish a fairly good illuminant.

Formaldehyde Tannin. *U. S. Pat. No. 598,914. Abstract in Leather Manufacturer*, 9, 39.—This is a new substance patented by H. C. Durkopf, and called methylene digallotannic acid. It is made by the condensation of tannin with formaldehyde in the presence of hydrochloric acid. The formula assigned to it is $CH_2\begin{cases}\text{Tannin radical.}\\ \text{Tannin radical.}\end{cases}$

BIOLOGICAL CHEMISTRY.

W. R. WHITNEY, REVIEWER.

An Exudation from Larix Occidentalis. By HENRY TRIMBLE. *Am. J. Pharm.*, **70**, 152–153.—This is not a resinous exudation but of a saccharine nature, and is said to be used as a food by Indians. It was found to contain 19.38 per cent. reducing sugar, 68.69 per cent. non-reducing sugar, 5.02 per cent. moisture, 0.41 per cent. ash, and 6.47 per cent. fibre.

Diastatic Fungi and Their Utilization. By JOKICHI TAKAMINE. *Am. J. Pharm.*, **70**, 137–141.—The author describes the manufacture of taka-moyashi, taka-koji, and taka-diastase. A fungus, the Japanese moyashi, is employed. This is cultivated in a starchy material as ground corn, which has been steamed to gelatinize the starch. The spores resulting from the growth of the fungus are separated by sifting. This product is known as taka-moyashi. Taka-koji results from mixing the spores with steamed wheat bran and allowing the culture to grow until a maximum diastatic value is reached. Taka-diastase is precipitated from the aqueous extraction of taka-koji by addition of alcohol.

Preliminary Observations on a Case of Physiological Albuminuria. By TORALD SOLLMANN AND E. C. MCCOMB. *J. Expt. Medicine*, **3**, 138–145.—This is the study of a case of occurrence of coagulable proteids in human urine which lasted for a considerable period and was unaccompanied by symptoms of disease. During four months of investigation the quantity of proteid present varied but little from day to day. The average daily quantity was 0.5317 gram. It was found to vary directly as the urea and inversely as external temperature. The influence of sleep, of dietary changes, of diuretics, and of drugs acting on the circulation, were also observed.

On the Occurrence of Methyl Salicylate. By EDWARD KREMERS AND MARTHA M. JAMES. *Pharm. Rev.*, **16**, 100–108.—This contains a collection of abstracts of the literature on the occurrence of this ester in plants.

The Present Condition of Formaldehyde as a Disinfectant. By C. O. PROBST. *Ohio Sanitary Bull.*, **2**, 36–42.—While the author's paper is only a summary of recent work on the subject, the discussion which follows it shows how generally this disinfectant is being used and also that its superiority over burning sulphur is held in doubt. The author evidently believes that failures in the case of the formalin may be attributed to causes which will soon be removed by a clearer understanding of the

conditions necessary and quantities of the gas requisite for proper fumigation.

Alkaloidal Constituents of Cascarilla Bark. By W. A. H. Naylor. *Am. J. Pharm.*, 70, 237–239.—The author believes that from this bark he has extracted two alkaloids, betaïne and cascarilline.

E. H. Richards, Reviewer.

Dietary Studies in New York City. By W. O. Atwater and Charles D. Woods. *Expt. Sta. Bull. U. S. Dept. Agr.*, 46, 1–117.—In many respects this is the most satisfactory of the dietary studies thus far published by the U. S. Dept. of Agriculture, partly because a summary only of the results is given in the text and the details reserved for the appendix, and partly because of the variety of occupation and condition of the 23 families. These studies were made among the so-called poor in the worst congested districts of New York, and yet 11 of the 23 families paid daily 20 cents and over per person for food, and 2 of them over 40 cents, while only 3 spent as little as 16 cents. The calculation of the cost of each 1,000 calories in the different dietaries brings out more clearly the lack of economy in buying. A well-selected dietary may be made up so as to cost from 5 to 5.5 cents per 1,000 calories; only 4 of the list given come within this limit, while 8 cost over 7 cents per 1,000 calories, and one of these high cost dietaries furnished the lowest total food value found.

A Digest of Metabolism Experiments. By W. O. Atwater and C. F. Langworthy. *Expt. Sta. Bull. U. S. Dept. Agr.*, 45, 1–434.—The Department of Agriculture has done great service to all students of problems relating to food and nutrition, in bringing together a summary of the results hitherto obtained, however contradictory they may be.

G. W. Rolfe, Reviewer.

Observations on Some of the Chemical Substances in the Trunks of Trees. By F. H. Storer. *Bull. Bussey Inst., Harvard Univ.*, 35, 386–408.—This is an able and suggestive paper on the nature and origin of the carbohydrates stored in the wood of trees. It also discusses analytical methods for the differentiation of starches and of pentosans and their limitations, the distribution of starch and pentosans in the tree, and their comparative food values interpreted by the habits of rodents and certain economic uses. Many analytical data are given and many authorities cited.

SANITARY CHEMISTRY.

E. H. RICHARDS, REVIEWER.

Recent Work in England on the Purification of Sewage. BY LEONARD P. KINNICUTT. *J. Am. Chem. Soc.*, **20**, 185–194.—The author writes from personal observation of the favorable results of experiments made in the more efficient utilization of those bacterial agencies which, in absence of air, accomplish the quick solution of a large part of the organic substances met with in ordinary town sewage.

Municipal and Other Water Supplies. *North Carolina Board of Health Sixth Biennial Rep., 1897*, 56–96.—Analyses of twenty samples of water from various towns in North Carolina are given, with reports and correspondence in regard to bacteriological examinations. The whole statement is instructive as to the status of sanitary knowledge and control in many of the states.

The Interpretation of Sanitary Water Analysis. BY FLOYD DAVIS. *Eng. Mag., 1898*, 68.

Engineering Chemistry of Boiler Water. BY H. HEFFEMANN. *Railway and Eng. Rev., 1898*, 203.

The Purification of River Water Supplies. BY A. HAZEN. *Eng. Mag., May, 1898.*

AGRICULTURAL CHEMISTRY.

W. R. WHITNEY, REVIEWER.

The Relative Sensibility of Plants to Acidity in Soils. BY WALTER MAXWELL. *J. Am. Chem. Soc.*, **20**, 102–107.—Of a number of vegetables, cereals, etc., the greater part were found to be exceedingly sensitive to the presence of acid. Millet and maize were least affected by acid.

Milk Fat from Fat-free Food. BY F. H. HALL. *N. Y. Agr. Expt. Sta. Bull., Popular Edition*, 132.—An experiment is described in which materials which were practically fat-free, were fed to a cow during a period of three months. The fat which the cow produced in the milk during this time was not derived, the author believes, either from fat in the food, from stored fat of the animal's body, or from proteids in its food, nor was it formed at the expense of two or more of these. A part at least must have come from carbohydrates of the food. That fat may be formed from carbohydrates has been pretty generally recognized and was discussed in the *U. S. Expt. Sta. Rec.*, **7**,

538, and **8**, 179. That protein does not produce fat is also there stated as the result of Pfluger's work.

Cotton Culture. Fertilizer Formulas. By. R. J. Redding. *Georgia Expt. Sta. Bull.*, **39**, and **Experiments with Cotton.** By J. F. Duggar. *Ala. Agr. Expt. Sta. Bull.*, **89** and **91**.—These contain accounts of experiments with different varieties of cotton plants under the influence of different fertilizing mixtures.

Analyses of Commercial Fertilizers. *Kentucky Agr. Expt. Sta. Bull.*, 71.

The Chemical Composition of Utah Soils, Cache and Sanpete Counties. *Utah. Agr. Coll. Bull.*, 52.

Cooperative Experiments made by the Ohio Students' Union. *Ohio Agr. Expt. Sta. Bull.*, **88**.

Cooperative Fertilizer Experiments with Cotton in 1897. *Ala. Agr. Expt. Sta. Bull.*, **91**.

Experiments with Corn. *Ala. Agr. Expt. Sta. Bull.*, **88**.

Experiments with Cotton. *Ala. Agr. Expt. Sta. Bull.*, **89**.

Concentrated Feed-Stuffs. *Hatch Expt. Sta. of Mass. Agr. Coll. Bull.*, 53.

Calories of Combustion in Oxygen of Cereals and Cereal Products, Calculated from Analytical Data. By H. W. Wiley and W. D. Bigelow. *J. Am. Chem. Soc.*, **20**, 304–316.

F. H. Thorp, Reviewer.

Corrosive Sublimate and Flour of Sulphur for Potato Scab. Experiments made in 1896. By H. Garman. **The Use of Corrosive Sublimate for Potato Scab in 1897.** By H. Garman. *Ky. Agr. Expt. Sta. Bull. No.* **72**, Feb., 1898.—The first of the above investigations was made to determine whether the scab fungus was introduced into the soil on the seed potatoes. Before planting, the potatoes were rolled in flowers of sulphur or soaked for an hour in a solution of mercuric chloride ($4\frac{1}{2}$ ounces in 30 gallons of water). The test showed that sulphur had little effect in preventing scab but that mercuric chloride did check the disease very greatly. The second investigation was to determine the strength of the mercuric chloride solution that could be safely used in treating the seed potatoes. The results showed that treatment of the seed reduced the proportion of scabby potatoes; that the percentage of scab diminishes with the increase of the strength of the solu-

tion used; that short soaking of the seed in strong solution was as effective as long exposure to weaker solutions; and that very strong solutions caused some reduction in the yield, if the soaking was prolonged. Treatment for one hour with 4½ ounces of corrosive sublimate per gallon of water was found most suitable. Stronger solutions may be used for short soaking.

ASSAYING.

H. O. HOFMAN, REVIEWER.

A Cement for the Assay Office. BY R. MARSH. *Eng. Min. J.*, 65, 37.—The author recommends for repairs of cracks in muffles from 1 to 2 parts litharge and 10 parts bone ash mixed dry and then moistened with water to the consistency of paste. This cement will stand fire, be tight, hard and strong, and will not crack.

The Assay of Copper Bullion. BY A CORRESPONDENT. *Eng. Min. J.*, 65, 223.—The method recommended is as follows: Weigh 1 assay ton into a No. 5 beaker, add 120 cc. cold water, then 100 cc. nitric acid, boil when violent action ceases until red fumes disappear, dilute to 300 cc., filter through 11 cm. paper, sprinkle 2½ grams test-lead over it and, having gathered together the edges, press into a 2½ inch scorifier charged with 5 grams test-lead so as to flatten out the point of the filter. Add to the hot filtrate a slight excess of brine, stir vigorously (by hand, by compressed air, or other mechanical device), when silver chloride will settle out in about 30 minutes with 20 oz. copper. Filter through a double filter, sprinkle with test-lead as before, and transfer to scorifier containing gold filter, place in front of muffle, dry paper and burn. Then place scorifier in the opening of muffle to finish incineration, cover sintered mass with 15 grams test-lead and ½ gram borax glass and scorify. This gives a button weighing about 4 grams, which is cupelled in a small cupel and parted.

The Assaying of Gold Bullion. BY C. WHITEHEAD AND T. ULKE. *Eng. Min. J.*, 65, 189.—This paper is a short description of the method employed at the mint. This is discussed under the heads, melting and sampling, gold assay, determination of base metals, determination of silver.

The Assaying of Silver Bullion. BY C. WHITEHEAD AND T. ULKE. *Eng. Min. J.*, 65, 250–251.—This paper discusses the assay of silver bullion at the mint in the same manner as a previous one did the gold assay. It covers grading and sampling of bullion, standardizing of the sodium chloride solution, determination of the silver, influence of alloyed metals and organic matter, and accuracy and rapidity of the assay.

METALLURGICAL CHEMISTRY.

H. O. HOFMAN, REVIEWER.

The Influence of Altitude on Smelting. BY H. LANG. *Eng. Min. J.*, **65**, 131–132.—The author attributes the greater consumption of fuel at a high altitude than at a low one to the fact that as the intensity of combustion depends upon the atmospheric pressure, at a high altitude the gases leave a furnace in a more attenuated condition than at a low one and consequently absorb and carry away a greater amount of heat which has to be made up by a greater amount of fuel. Referring to the above paper, J. T. Smith (*Ibid.* p. 277) states that by arching over the top of the cupola in an iron foundry and having the side-exits closed by flap-doors, a greater pressure was maintained than that of the air outside and a considerable saving of fuel effected, the percentage of fuel being 7 on the pig charged. With a cupola 36″ in diameter, narrowing down to 22″ at the crucible, 18000 lbs. were melted down in one hour and thirty-five minutes from the time the blast was started.

Recent Smelting Practice in Colorado. BY L. S. AUSTIN. *Eng. Min. J.*, **65**, 282–283.—The practice of lead and copper smelting in Colorado and other parts of the country has undergone important change which is briefly reviewed in this paper. The subjects discussed are: Sampling ores and base bullion, size of furnaces and management, recovery of flue-dust, automatic charging, roasting of ores, the separation and disposal of slag, handling of materials, reverberatory smelting, blast-furnace fuel and changes in character of ore smelted. The conclusion that the writer arrives at is that the changes have been mainly in the mechanical details for the saving in labor and the better separation of waste from main and intermediary products.

The Garretson Copper Smelting Furnace. BY O. S. GARRETSON. *Eng. Min. J.*, **65**, 160–161.—The aim with this blast-furnace is to carry on in one continuous operation the three necessary processes for treating a sulphide copper ore, *viz.*, roasting, smelting, and converting. While it has the high endorsement of Dr. E. D. Peters, Jr., the reviewer cannot but believe that this furnace will fail to do satisfactory work more often than it will prove a success, because the three processes require for the best work conditions differing too much to be obtainable in a single furnace. Should this great difficulty be temporarily overcome, it is almost inevitable that the slightest changes will prove detrimental to one or the other process.

A Copper-Arsenic Compound. BY H. C. HAHN. *Eng. Min. J.*, **65**, 401.—The author found in a salamander of a lead

blast-furnace dark green hexagonal crystals which upon analysis showed the following composition in percentages: Cu. 61.03, Fe. 0.97, Pb. 0.44, As. 35.50, Sb. 1.08, S. 0.89, Total 99.91, corresponding to the formula Cu_3As. The sp. gr. at 10° C. was 7.976, at 20° C. 8.008, at 30° C. 7.578.

The Electrolytic Production of Zinc. By Editor. *Eng. Min. J.*, **65**, 336.—The paper briefly reviews the leading processes for the electrolytic reduction of zinc; *viz.*, the processes of Ashcroft, Siemens-Halske, Dieffenbach and Hoephner, and concludes that at present zinc can be electrolytically produced with profit only when the zinc is removed from ores containing more valuable metals so as to permit them to be satisfactorily treated.

Notes on Aluminum. By J. M. Smith. *Assoc. Eng. Soc.*, **20**, 1–19; *Discussion*, 19–23.—The paper offers little that is new, being a brief review of the properties of aluminum and its alloys, of the ores, of the manner of preparing the alloys and of the Hall, the Héroult and Minet processes for producing the metal. The discussion brings out the proposed use of aluminum wire as electric conductor and the use of the metal in the manufacture of semi-steel.

The Dry Separation of Gold and Copper. By F. R. Carpenter. *Eng. Min. J.*, **65**, 193.—After a general discussion of methods of separating gold and copper, the writer outlines his recently patented process (No. 897,139, January 11, 1898), which consists in exposing metallic copper containing silver and gold to an oxidizing fusion when cuprous oxide and, in the presence of silica, cuprous silicate will form. Both are readily fusible and take up little silver and hardly any gold. By drawing off the oxidized copper from the surface of the metal bath, as with litharge in cupelling, a satisfactory separation of copper from precious metal can be effected. An addition of lead toward the end of the process protects the silver so that a larger percentage remains with the gold than would be otherwise the case. The oxide or silicate of copper is sold to copper works or used again for collecting precious metal in smelting pyritic ores free from or low in copper.

Temperature in Amalgamation. By F. R. Carpenter. *Eng. Min. J.*, **65**, 126–127.—At the Homestake gold mines, Lead City, S. D., two amalgamating batteries were run by T. J. Grier upon the same ore, in one the battery water had a temperature of 50° F., in the other, of 60° F. and over. The yield in gold with the former was found to be decidedly greater than with the latter. The explanation of this appears to be that warm water, making the low-grade amalgam from the fine gold

fluid, causes it to run off more readily from the plates than cold water which leaves the amalgam more pasty and hard and more firmly adhering to the plate.

Experiments on Roasting Telluride Ores. By E. D. Skewes. *Eng. Min. J.*, **65**, 488.—This paper is a record of experiments made in Western Australia. In dry-crushing a silver-bearing telluride gold ore with 3.66 per cent. sulphur and 0.33 per cent. copper and then roasting, the sulphur being eliminated to 1 per cent., it was found that the loss in precious metal was very much lower than when it had been wet-crushed. The cause of this was discovered to be in the water used which contained 8.5 per cent. solid matter; *viz.*, $MgCl_2$ and NaCl, 6.95, CaO, 0.86, Al_2O_3 and Fe_2O_3 0.49, S 0.12. The chlorides of the water remained with the ore, being decomposed in the roast and volatilizing the precious metals.

Ore Treatment in Boulder County, Colo. By C. C. Burger. *Eng. Min. J.*, **65**, 129–130.—The gold ores of Boulder County are sulphides and tellurides, the former are treated by the Colorado system of battery amalgamation, the latter by leaching with potassium cyanide and chlorine water. The paper describes the technical details of the barrel-chlorinating plant of the Delano Mining and Milling Co., some of the novel points of which may be recorded. As to general arrangement, the crushing, roasting, and chlorinating houses are on level ground instead of on a hill-side, as is, or rather was, usual, the ore being handled by belt elevators and belt and screw conveyors. The ore is roasted at a high temperature in a Pearce turret furnace which has water-cooled rabble-arms and plow-shaped rabbles of forged steel. The loss of gold by volatilization is very slight. The roasted ore is automatically cooled and delivered into the hoppers of the chlorinating barrels. The raw ore contains 2.5 per cent. sulphur; in the roasted ore the sulphur must be reduced a few hundredths of one per cent. if an extraction of 95 per cent. of the gold is to be attained. The barrels used hold 5-ton charges. They have the Rothwell quartz filter, the quartz having been crushed to pass a 2-mesh sieve. This allows the slimes to pass through the filter, and these have to be settled in clarifying vats before the gold can be precipitated. For solution there is required per ton of ore 10 lbs. bleaching powder, 15 lbs. sulphuric acid of 66° B., and for precipitation $\frac{1}{8}$ lb. sulphur, $\frac{3}{4}$ lb. iron sulphide, and $1\frac{1}{4}$ lbs. sulphuric acid.

Chlorinating and Cyaniding. By C. C. Burger. *Eng. Min. J.*, **65**, 427.—A continued discussion (*this Rev.*, **4**, 36).

Absorption of Gold by Wooden Leaching Vats. By F. L. Bosqui. *Eng. Min. J.*, 65, 248.—Many losses of gold in lixiviation plants are attributed, for want of a better explanation, to absorption by the wooden leaching vats. An investigation of the subject gave the author results which prove that the amount of gold taken up by the vats is relatively small. California redwood absorbed 22 per cent. of its weight of solution. Assuming it to be 50 per cent., a vat weighing 6 tons would absorb 3 tons of solution worth about $5.00 in gold per ton. With plants treating from 3000 to 4000 tons tailings per month, the loss would not be very much noticed. But the absorption might be cumulative, the leaching vats being part of the time exposed to air, when absorbed solution being partly evaporated, gold might be deposited. The author made a series of experiments with different kinds of woods and with intermittent and continuous contact of wood and solution. He found the amounts of gold absorbed to be exceedingly small by either method of contact.

Influence of the Anodes in Depositing Gold from Its Cyanide Solutions. By E. Andreoli. *Eng. Min. J.*, 65, 100–101.—In the Siemens and Halske process, carried out successfully in the Transvaal, gold is recovered from dilute cyanide solutions which would be lost if it were precipitated by zinc shavings. Iron anodes and sheet lead cathodes are used. The iron anode is attacked, forming Prussian blue, which contaminates the electrolyte and hinders a perfect precipitation of the gold, only from 60 to 70 per cent. being recovered. The lead has to be replaced when the gold is separated by cupellation. The author found that an anode of peroxidized lead was absolutely insoluble and lasted any length of time; he recommends the use of iron cathodes from which the deposited gold is to be separated by immersion in melted lead.

Notes on the Moebius Process for Parting Gold and Silver as Carried on at the Guggenheim Smelting Works, Perth Amboy, N. J. By P. Butler. *Can. Min. Rev.*, 17, 81–88.—The paper describes in a brief elementary way the three departments of the works: electrolytic copper refining by the multiple process, desilverizing of base bullion by the Parkes process, and electrolytic parting by the Moebius process. The many carefully made, but badly printed drawings accompanying the paper, lose some of their value by not being either dimensioned or having the scale given to which they were made.

Molding Sand. By D. H. Truesdale. *J. Am. Foundrymen's Assoc.*, 3, 159–176.—The paper treats in detail of the four leading properties of molding sand; *viz.*, refractoriness, porosity, fineness, and bond.

XUM

Comparative Fusibility of Foundry Irons. By Th. D. West. *J. Am. Foundrymen's Assoc.*, 3, 127–158.—The author shows that chilled iron will melt faster than gray iron of the same composition and advocates the use of sandless pig for foundry purposes. He further discusses the changes in composition due to re-melting, the production of semi-steel castings, and the shrinkage and contraction of cast iron.

Effects of Phosphorus on the Strength and Fusibility of Iron. By Th. D. West. *J. Am. Foundrymen's Assoc.*, 4, 123–128.—The author carried on a series of experiments to show the strength and fluidity of foundry iron was increased by the addition of phosphorus.

Carbon and Strength of Iron. By G. R. Johnson. *Iron Trade Rev.*, 21, 8. The author contends that in the analyses according to which pig iron is sold, both carbons should be included, not alone silicon, sulphur, phosphorus, and occasionally manganese, as the strength of the pig increases with a diminishing percentage of carbon.

Value of Metalloids in Cast Iron. By M. McDowell. *J. Am. Foundrymen's Assoc.*, 4, 97–114. The author gives the subjoined table:

No.	Kind.	Price per ton.	Total C.	Si.	P.	S.	Mn.
1	Foundry	$12.00	3.68	2.90	0.75	0.01	0.30
2	Foundry	11.50	3.30	2.25	0.70	0.02	0.40
3	Foundry	11.00	3.25	1.50	0.30	0.03	0.50
4	Gray forge	10.50	3.80	1.00	0.65	0.04	0.62
5	Mottled forge	10.00	3.75	0.70	0.50	0.05	0.05(?)
6	White forge	9.50	3.65	0.40	0.35	0.10	0.96

to show how the value of pig iron increases with the silicon it contains and what harm is done by the sulphur, each unit of which is said to neutralize 10 units of silicon. The table also demonstrates the necessity of the presence of manganese and the value of phosphorus. In a second table, representing six different heats, the author brings out the changes foundry iron may undergo in composition and physical properties.

Oxidation of Foundry Metals. By T. D. West. *J. Am. Foundrymen's Assoc.*, 4, 115–123. The paper is an experimental study into the loss of metal incurred in foundries from oxidation which is claimed to be greater when pig iron is cast in chills instead of in sand.

Annealing of Malleable Cast Iron. By G. C. Davis. *J. Am. Foundrymen's Assoc.*, 4, 86–91.—This paper is mainly a review of one read by G. P. Roylston before the English Iron

and Steel Institute. The author, however, brings out some of the differences between English and American practice. For instance, in England the pig iron used contains 0.112 per cent. manganese giving a casting with 0.043 per cent. manganese ; in this country the mixture contains 0.40–0.80 per cent. and the casting 0.20–0.40 per cent. manganese. The silicon in the product from a Western foundry ranged from 0.75 to 0.98 per cent. Sulphur must be low, under 0.11 per cent., as, if present in larger amounts, it interferes with annealing. Thus, a $\frac{3}{8}$-inch casting with 0.133 per cent. S. showed after the first annealing G. C. 0.547, C. C. 0.515 ; after the second annealing G. C. 0.505, C. C. 0.380. Roll-scale is generally used here instead of iron ore as in England, the scale being reoxidized at intervals by spreading on the floor and sprinkling with ammonium chloride. The annealing pots are cast from cupola metal and last for five or six heats.

What is Semi-steel ? By A. E. Outerbridge. *Digest of Phys. Test*, **3**, 99–103.—The object of this paper is to show that calling the product obtained by charging a cupola with pig iron and steel and wrought iron scrap by the new name, semi-steel, is not justified, as chemically it shows no resemblance to steel or malleable iron, and physical tests show an equally great divergence ; in fact, the so-called semi-steel is simply a strong, close-grained cast iron.

APPARATUS.

A. H. Gill, Reviewer.

A Constant Temperature Device. By H. P. Cady. *J. Phys. Chem.*, **2**, 242.—It comprises an apparatus in which a circulation of water at a constant temperature is attained by means of a siphon emptying into a rotating funnel. The rotation causes the water in the center of the funnel to become depressed which sets the siphon in action.

A New Form of Hydrogen Generator. By E. W. Magruder. *Am. Chem. J.*, **19**, 810.—The apparatus is designed to take the place of the Bunsen electrolytic generator, and obviates the difficulties of that form by having the electrodes in separate tubes. The apparatus is said to yield pure hydrogen and may be obtained of Greiner, of New York.

A New Form of Discharger for Spark Spectra of Solutions. By L. M. Dennis. *J. Am. Chem. Soc.*, **20**, 1.

A New Electrolytic Stand. By G. T. Hough. *J. Am. Chem. Soc.*, **20**, 268.

A Modified Air-bath. By F. P. Venable. *J. Am. Chem. Soc.*, **20**, 271.

A Collector for Distillation of Ammonia from Water. By F. P. Dunnington. *J. Am. Chem. Soc.*, **20**, 286.

A Device to Prevent Loss by Spattering. By A. H. Low. *J. Am. Chem. Soc.*, **20**, 233.

[CONTRIBUTION FROM THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY.]

REVIEW OF AMERICAN CHEMICAL RESEARCH.

VOL. IV. NO. 7.

ARTHUR A. NOYES, Editor; HENRY P. TALBOT, Associate Editor.
REVIEWERS: Analytical Chemistry, H. P. Talbot and W. H. Walker; Biological Chemistry, W. R. Whitney; Carbohydrates, G. W. Rolfe; General Chemistry, A. A. Noyes; Geological and Mineralogical Chemistry, W. O. Crosby; Inorganic Chemistry, Henry Fay; Metallurgical Chemistry and Assaying, H. O. Hofman; Organic Chemistry, J. F. Norris; Physical Chemistry, H. M. Goodwin; Sanitary Chemistry, E. H. Richards; Technical Chemistry, A. H. Gill and F. H. Thorp.

INORGANIC CHEMISTRY.

HENRY FAY, REVIEWER.

On the Action of Hydrogen Sulphide upon Vanadates. BY JAMES LOCKE. *Am. Chem. J.*, **20**, 373–376.—Hydrogen sulphide reacts with sodium vanadate in the cold, but owing to the formation of sulphovanadate on the surface the reaction is not complete unless the liquid is heated to 500°–700°. At this temperature the author finds that the absorption of hydrogen sulphide is almost violent. The increase of weight in the sodium vanadate corresponds to that required by the reaction:

$$Na_3VO_4 + 3H_2S = Na_3VOS_3 + 3H_2O.$$

The sulphovanadate formed in this way corresponds to the salt described by Krüss, which was made in the wet way. Sodium pyrovanadate reacts with hydrogen sulphide with the formation of the sulphovanadate, $Na_4V_2O_2S_5$, which resembles potassium permanganate in appearance. The salt is exceedingly hygroscopic, dissolves in water to a deep reddish purple solution, which gradually loses hydrogen sulphide, changing to the colorless sodium pyrovanadate. This change of color is also characteristic of the free sulphovanadic acids, but it was found impossible to isolate a pure compound. The vanadates of the heavy metals are not so readily changed to the sulphovanadates. Lead pyrovanadate, however, passes over to the sulphovanadate, $Pb_2V_2O_2S_5$, on heating in a current of hydrogen sulphide at a full red heat.

Some New Lime Salts. BY H. C. HAHN. *Eng. Min. J.*, **65**, 404.—By evaporating slowly a solution of calcium hydroxide which had been saturated with hydrogen sulphide crystals of the composition $CaS.3H_2O$ were obtained; by heating, filtering,

and again saturating with hydrogen sulphide and evaporating, crystals having the composition $CaS.H_2O$ were deposited.

The Solubility of Silver Chloride. By H. C. Hahn. *Eng. Min. J.*, **65**, 434.—A solution containing 475.3 grams of $CaCl_2$ in one liter dissolves 2.835 grams silver chloride at 0°, and 8.147 grams at 100°. It is stated that the solubility is greater in saturated solutions of magnesium chloride.

Upon the Salts of Hydronitric Acid. By L. M. Dennis and C. H. Benedict. **Crystallographic Notes.** By A. C. Gill. *J. Am. Chem. Soc.*, **20**, 225–232.—The lithium, sodium, potassium, cesium, and rubidium salts were prepared by neutralizing the corresponding hydroxides with the free acid, and the calcium, strontium, and barium salts by dissolving the oxides in the free acid. The lithium and barium salts both crystallize with one molecule of water, and their crystalline forms cannot be compared with the other members of their series. With the exception of the sodium salt which crystallizes in the hexagonal system, the salts of the other alkalies are tetragonal and isomorphous. The anhydrous salts of the alkaline earth group are probably orthorhombic.

Introductory Note on the Reduction of Metallic Oxides at High Temperatures. By Fanny R. M. Hitchcock. *J. Am. Chem. Soc.*, **20**, 232–233.—This note states that nitrogen is given off from tungstic and molybdic oxides when reduced in a current of hydrogen.

Some Properties of Zirconium Dioxide. By F. P. Venable and A. W. Belden. *J. Am. Chem. Soc.*, **20**, 273–276.—Ignited zirconia is practically insoluble in all acids except hydrofluoric, and is unattacked by heating with sodium carbonate. The specific gravity of an ignited sample was found to be 5.409. Determinations of water in zirconium hydroxide, which had been washed free from ammonia and with alcohol and ether, or with petroleum ether, gave figures which do not correspond to any definite degree of hydration, although when washed with petroleum ether approximately 26.00 per cent. of water remained. The hydroxide precipitated in the cold is insoluble in water, but readily soluble in dilute and strong hydrofluoric, hydrochloric, and hydrobromic acids. Oxalic acid dissolves it readily. When precipitated from a hot solution the solubility in acids is much decreased. Ammonia is without action on the hydroxide, but a saturated ammonium carbonate solution dissolves one part in a hundred. Varying quantities of carbon dioxide are taken up in the dry and moist conditions.

Ammonium Selenide. By Victor Lenher and Edgar F. Smith. *J. Am. Chem. Soc.*, **20**, 277–278.—A solution of five grams of ammonium molybdate in 50 cc. of water to which 20 cc. of strong ammonia had been added, was saturated with hydrogen sulphide; and the resulting deep red solution was concentrated in a vacuum over sulphuric acid. Black, anhydrous, orthorhombic prisms of ammonium selenide separated. The crystals, after they are freed from metallic selenium by extraction with carbon bisulphide, dissolve in water to a deep red solution, which precipitates selenides from neutral or alkaline solutions of metallic salts.

Action of Sulphur Monochloride upon Minerals. By Edgar F. Smith. *J. Am. Chem. Soc.*, **20**, 289–293.—Sulphur monochloride reacts with many minerals with the formation of the chlorides of the metals present; with sulphides the sulphur of the mineral remains dissolved in the sulphur monochloride. The reaction is both oxidizing and substituting, and takes place with some minerals in the cold, while with others complete decomposition is accomplished only by heating.

Note on Liquid Phosphorus. By F. P. Venable and A. W. Belden. *J. Am. Chem. Soc.*, **20**, 303–304.—The authors have failed to obtain the liquid modification of phosphorus, previously described by Houston and Thompson.

The Oxyhalides of Zirconium. By F. P. Venable and Charles Baskerville. *J. Am. Chem. Soc.*, **20**, 321–329.—The oxychloride, $ZrOCl_2.8H_2O$, crystallizes from water; and from its solution hydrochloric acid precipitates the salt $ZrOCl_2.6H_2O$. Either of these salts dried at 100°–125° in hydrochloric acid gas, forms the oxychloride, $ZrOCl_2.3H_2O$, which may also be formed by crystallizing a solution of zirconium hydroxide in hydrochloric acid. Oxybromides prepared by dissolving zirconium hydroxide in hydrobromic acid are described; but much difficulty was experienced in obtaining definite compounds on account of the tenacity with which the hydrobromic acid was held by the crystals. Salts represented by the formulas $ZrOBr_2.13H_2O$, $ZrOBr_2.14H_2O$, $ZrOBr_2.4H_2O$, $ZrBr(OH)_3.2H_2O$, and $ZrBr(OH)_3.H_2O$ are described, but the analytical data would indicate that some of them at least are not definite compounds, but merely transition forms. Gelatinous compounds were formed in several cases, but these were not studied.

ORGANIC CHEMISTRY.

J. F. NORRIS, REVIEWER.

On the Action of Acetic Anhydride on Phenylpropiolic Acid. BY ARTHUR MICHAEL AND JOHN E. BUCHER. *Am. Chem. J.*, **20**, 89–120.—It has been shown by the authors that acetic anhydride reacts with acetylenedicarboxylic acid to form the anhydride of acetoxylmaleïc acid, which gives oxalacetic acid on treatment with water. If acetic anhydride should react with phenylpropiolic acid in an analogous manner, the anhydride of β-acetoxylcinnamic acid would be formed, and this compound on decomposing with water would yield a β-hydroxycinnamic acid. As it seemed of theoretical interest to ascertain whether a product obtained in such a manner is identical with the benzoylacetic acid got by saponification of its esters, the above reaction was studied. The reaction took place in an entirely different way, however, a derivative of naphthalene being formed. When phenylpropiolic acid was heated with acetic anhydride, the anhydride of 1-phenyl-2,3-naphthalenedicarboxylic acid was formed, together with a small quantity of the mixed anhydride of acetic and phenylpropiolic acids. From its solution in alkalies the former is precipitated as the anhydride by acids. The sodium, barium, calcium, and silver salts, and the methyl ester of the acid were analyzed. By reduction of the anhydride, $C_{18}H_{10}O_3$, in alkaline solution with sodium amalgam, 1-phenyl-1, 2,3,4-tetrahydro-2,3-naphthalenedicarboxylic acid was formed. Neutralized with ammonia its solution gave white crystalline precipitates with solutions of barium, calcium, and mercuric chlorides. Silver nitrate precipitated the salt $C_{18}H_{14}O_4Ag_2$. The anhydride of the acid was also prepared. When reduced in acetic acid solution the anhydride $C_{18}H_{10}O_3$ gave a lactone of the formula $C_{18}H_{12}O_2$, and when oxidized by potassium permanganate, 1-phenyl-2,3,5,6-benzenetetracarboxylic acid was formed. From the latter the silver, barium, calcium, and lead salts, the methyl and benzyl esters, and anhydride were prepared. When the barium salt of the acid was distilled with barium hydroxide diphenyl was obtained. A small amount of an acid isomeric with the above, which also yielded diphenyl when distilled with barium hydroxide, was obtained in the oxidation. The hydrocarbon obtained from the anhydride $C_{18}H_{10}O_3$ was shown to be α-phenylnaphthalene by oxidizing it to *o*-benzoylbenzoic acid. The authors point out the analogy between the formation of phenylnaphthalenedicarboxylic anhydride from phenylpropiolic acid and the formation of the isatropic acids from atropic acid (Fittig, *Ann. Chem.*, **206**, 34). They also offer explanations of the steps involved in the condensation of acetic anhydride and phenylpropiolic acid.

On the Conversion of Methylpyromucic Acid into Aldehydopyromucic and Dehydromucic Acids. By H. B. Hill and H. E. Sawyer. *Am. Chem. J.*, **20**, 169–179.—In order to establish experimentally the structure of dehydromucic acid, its synthesis from methylpyromucic acid was effected. Methylpyromucic acid was converted into ω-brommethylpyromucic acid, and the latter was changed into the dibrom derivative by the action of bromine in the sunlight. As the yield was small, methylpyromucyl chloride was made, treated with bromine, and the resulting ω-dibrompyromucyl bromide heated with water, when aldehydopyromucic acid was obtained. The phenylhydrazone and oxime of the latter acid were prepared. Aldehydopyromucic acid was readily converted by oxidation with silver oxide into dehydromucic acid.

On the 3,4,5-Tribromaniline and Some Derivatives of Unsymmetrical Tribrombenzol. By C. Loring Jackson and F. B. Gallivan. *Am. Chem. J.*, **20**, 179–189.—In the course of an attempt to prepare the vicinal tetrabrombenzene, which did not lead to the desired result, 3,4,5-tribromaniline was prepared. As its properties did not agree with those which had been assigned previously to a compound of this structure, the substance and a number of its derivatives were carefully studied. The structure of the compound was established by its preparation from *p*-nitraniline. The dibrom substitution-product was first prepared, the amido group was next replaced by bromine, and finally the nitro group was reduced. 3,4,5-tribromaniline melts at 118°–119° and forms a chloride, bromide, and sulphate which are more stable than the analogous salts of *s*-tribromaniline. The following derivatives were prepared: tribromphenylurethane, tribromacetanilide, tribromnitraniline $NH_2{1},Br_3{3,4,5},NO_2{2}$, and the acetyl derivative of the last compound. In order to characterize more fully the 2,4,5-tribromaniline previously described by the authors (*Am. Chem. J.*, **18**, 247), derivatives similar to the above were studied. In their previous paper the authors state that tribromresorcine is the product of the action of sodium ethylate on tribromdinitrobenzene, $Br_3{1,2,4}$; $NO_2{3,5}$. The substance has been further studied and found to be tribromnitrophenetol.

Direct Nitration of the Paraffins. By R. A. Worstall. *Am. Chem. J.*, **20**, 202–217.—When normal hexane is boiled in an open flask with nitric acid (sp. gr. 1.42), or with a mixture of nitric and sulphuric acids, it is converted into nitro- and dinitrohexane. The best yield is obtained, however, when fuming acid is used. To separate the nitro-products, the reaction mixture is dried, and the unchanged hydrocarbon is distilled

off. This is treated with more acid. By several days' successive treatment hexane was completely converted into nitro- and oxidation-products, the yield of crude nitro-compounds amounting to about 60 per cent. of the theoretical. Nitrohexane is best separated from the dinitro compound of distillation with steam, with which it is volatile. It was shown to be a primary compound by the application of the nitrolic acid test and was reduced to a primary amine. The dinitrohexane formed has probably the structure $CH_3(CH_2)_4CH(NO_2)_2$. It carbonizes on distillation, cannot be solidified by a mixture of ice and salt, and dissolves slowly in concentrated aqueous solutions of potassium and sodium hydroxide forming a deep red solution. Normal heptane is capable of more rapid nitration than hexane. Twenty hours' treatment with nitric acid (sp. gr. 1.42) gave about 20 per cent. of the theoretical yield. The action of a mixture of sulphuric and nitric acids yields a considerable amount of dinitroheptane which forms a layer between the nitroheptane and the acids. As the dinitro-compound yielded on reduction hydroxylamine and ammonia, probably it has the structure $CH_3(CH_2)_5CH(NO_2)_2$. Octane was studied in the same way and gave analogous results. All of the hydrocarbons yielded the same oxidation products; *viz.*, carbon dioxide, acetic, oxalic, and succinic acids. Carbon dioxide is the most abundant oxidation product. The quantity of other substances formed by boiling the hydrocarbons two days with nitric acid did not exceed two per cent.

On the Silver Salts of 4-Nitro-2-Aminobenzoic Acid and Its Behavior with Alkyl and Acyl Halides. By H. L. Wheeler and Bayard Barnes. *Am. Chem. J.*, **20**, 217–223.—The alkali salts of the aminobenzoic acids and the sodium salts of the acyl amides do not give esters directly with alkyl halides, as the alkyl groups attach themselves entirely or partially to nitrogen. As a direct replacement of the metal takes place with the silver salts of the amides, oxygen esters being formed, the action of acyl and alkyl halides on the silver salt of an aminobenzoic acid was studied to determine whether or not oxygen esters were formed in this case. 4-nitro-2-amino-benzoic acid was used, as its esters are solid. The silver salt of the acid gave, as the chief product with ethyl iodide in molecular proportions, 4-nitro-2-ethylaminobenzoic acid. Some 4-nitro-2-ethylaminobenzoic ethyl ester was formed, but no 4-nitro-2-aminobenzoic ethyl ester was observed. The behavior of the silver salt is therefore analogous to that of the sodium salts of the amine acids. Acetyl chloride reacted with the silver salts of anthranilic and 4-nitro-2 aminobenzoic acids forming compounds in which the acetyl group was joined to nitrogen. Since the above silver salts, in

which the metal is joined to oxygen, give derivatives with acyl and alkyl halides containing the substituting group joined to nitrogen, it follows that the position of the metal in the salts or the amides cannot be determined by the structure of the reaction products, and that the sodium salts of the amides may have the metal joined to oxygen. The following substances are described: 4-nitro-2-acetaminobenzoic acid, and its sodium and silver salts; ethyl 4-nitro-2-acetaminobenzoate; 4-nitro-2-aminobenzoic acid, and its ammonium, sodium, and silver salts; methyl and ethyl 4-nitro-2-aminobenzoate; and 4-nitro-2-ethylaminobenzoic acid and its ethyl ester.

Formamide and Its Sodium and Silver Salts. By Paul C. Freer and P. L. Sherman, Jr. *Am. Chem. J.*, **20**, 221–228. —The authors show that pure formamide cannot be prepared by Hofmann's method. The products of distillation of ammonium formate under ordinary pressure are formamide, water, ammonia, formic acid, ammonium formate, carbon monoxide, hydrocyanic acid, and ammonium cyanide. When distilled in a vacuum ammonium formate readily dissociates, and ammonia and formic acid pass into the distillate. In order to prevent this dissociation ammonium formate was heated to 180° in a current of dry ammonia. The resulting formamide was fractionated in an atmosphere of ammonia under a pressure of about one-half mm. The distillate, which boiled at 85°–95°, was colorless, oily, possessed a high index of refraction, reacted neutral towards litmus, and, when kept free from moisture, was stable. At —1° it solidified to a white crystalline mass of long, irregular needles. Its specific gravity at 4° was 1.16. Sodium formamide did not react with organic halogen compounds; and when dissolved in alcohol it gave with silver nitrate a silver derivative as a white, curdy precipitate. The orange-red silver salt of formamide described by Titherly (*J. Chem. Soc.*, 72, 460) was shown to be impure, the color being due to a trace of sodamide in the sodium salt from which it was prepared.

On the Decomposition of Diazo Compounds. XIII.—A Study of the Reaction of the Diazophenols and of the Salts of Chlor- and Bromdiazobenzene with Ethyl and Methyl Alcohol. By Frank Kenneth Cameron. *Am. Chem. J.*, **20**, 229–251.—This paper, the thirteenth from the laboratory of Johns Hopkins University on the diazo compounds, gives the results of an investigation of the influence of the hydroxyl group and the elements chlorine and bromine, when substituted in the benzene nucleus, in determining the decomposition of diazo compounds with ethyl and methyl alcohols. Paradiazophenol chloride was decomposed by methyl and ethyl alcohols in the presence of sul-

phuric and hydrochloric acids, potassium hydroxide, ammonia, and sulphur dioxide. In all cases the hydrogen reaction took place, phenol being formed. Meta- and orthodiazophenol chlorides gave the same result. Orthochlordiazobenzene salts with methyl and ethyl alcohols gave the hydrogen reaction alone. Metachlordiazobenzene salts with ethyl alcohol gave the hydrogen reaction, but with methyl alcohol the methoxy reaction predominated, metachloranisol being the principal product. Parachlordiazobenzene nitrate and ethyl alcohol gave principally the hydrogen reaction, but at the same time, to no inconsiderable extent, the ethoxy reaction, accompanied by the formation of chlornitrophenol. With methyl alcohol the same diazo compound gave the methoxy reaction and some chlornitrophenol. Parachlordiazobenzene sulphate with ethyl alcohol gave the hydrogen and with methyl alcohol the methoxy reaction. The bromdiazobenzene salts were studied in the same way and gave analogous results. From the above and other work on the diazo compounds the following conclusions are drawn: 1. The alkoxy reaction is normal; and the hydrogen reaction, when it takes place, is a modification induced by special conditions. 2. Regarding water as the first member of the series, the more complex the alcohol, the greater the tendency towards the hydrogen reaction. 3. Acid radicals, COOH, Cl, Br, NO_2, etc., induce the hydrogen reaction, and their influence is probably in the above order. 4. The presence of the substituting radical in the ortho position is most favorable to the hydrogen reaction, and in the meta position is more favorable than in the para.

An Investigation of Some Derivatives of Orthosulphobenzoic Anhydride. By Michael Druck Sohon. *Am. Chem. J.*, **20**, 257–278.—The anhydride of *o*-sulphobenzoic acid was prepared by heating molecular quantities of the acid potassium salt of the acid and phosphorus pentachloride. It is a well-characterized stable substance and crystallizes from benzene. The anhydride dissolves in methyl and ethyl alcohols forming acid esters from which the silver and potassium salts were prepared. By heating the anhydride with the following phenols at above 135° sulphonphthaleïns were formed: phenol, *o*-cresol, *p*-cresol, resorcinol, orcinol, hydroquinol, pyrogallol, *m*-amidophenol, and *p*-amidophenol. By the action of dry ammonia on the anhydride dissolved in ether, the ammonium salt of benzamidesulphonic acid, $C_6H_4\begin{cases}CONH_2\\SO_3NH_4\end{cases}$, was formed. From the latter the potassium and barium salts were prepared, but it was impossible to obtain the free acid in crystalline condition. The anhydride reacts with aniline as it does with ammonia. The result-

ing anilido acid, $C_6H_4\begin{cases}CONHC_6H_5\\SO_3H\end{cases}$, is a very soluble oil, whereas the isomeric sulphanilido acid, $C_6H_4\begin{cases}COOH,\\SO_2NHC_6H_5\end{cases}$, is readily obtained in crystalline condition. The following salts of benzanilidosulphonic acid were prepared and analyzed: aniline, barium, ammonium, potassium, and cadmium. The sodium, copper, and lead salts evaporated to hard glasses and the silver salt decomposed on evaporation. By the action of phosphorus pentachloride on the potassium salt, he formed the anil,

$$C_6H_4\begin{cases}CO\\SO_2\end{cases}NC_6H_5.$$

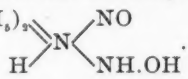
p- and *o*-toluidine reacted with the anhydride giving toluidine salts of benztoluidosulphonic acids, $C_6H_4\begin{cases}CONHC_7H_7\\SO_3NH_2C_7H_7\end{cases}$. From these the barium and potassium salts were prepared. Benzamide and acetamide were converted into nitriles by the anhydride. Phosphorus pentachloride acting on the anhydride produced both chlorides of *o*-sulphobenzoic acid, the formation of the unsymmetrical chloride being favored by high temperature, continued action, and an excess of phosphorus pentachloride.

The Relation of Trivalent to Pentavalent Nitrogen. By Arthur Lachman. *Am. Chem. J.*, **20**, 283–288.—The author has undertaken a study of the conditions necessary for the existence of trivalent and pentavalent nitrogen and for the passage of one form into the other. In this preliminary communication the action of hydrochloric acid, zinc ethyl, and hydroxylamine on nitrosamines, $R_2=N-N=O$, is described. Dimethyl and diethylnitrosamines form unstable hydrochlorides which are decomposed when heated at 60° in a sealed tube. If a rapid stream of hydrochloric acid gas is passed into diethylnitrosamine, nitrosyl chloride passes off and diethylamine hydrochloride is formed. The analogous reaction between diphenylnitrosamine and hydrochloric acid gas (both carefully dried) was found to take place quantitatively according to the reaction

$$(C_6H_5)_2NNO + HCl = (C_6H_5)_2NH + NOCl.$$

It is probable that an unstable addition-product containing pentavalent nitrogen of the formula $(C_6H_5)_2\overset{\displaystyle H}{\underset{\displaystyle ON}{\overset{\displaystyle \diagup}{\underset{\displaystyle \diagdown}{N}}}}\overset{\displaystyle \diagup}{\underset{\displaystyle \diagdown}{}}Cl$ was first formed. Diphenylnitrosamine and zinc ethyl form a stable addi-

tion-product, which is decomposed by water or alcohol without evolution of a gas, the products being zinc hydroxide, diphenylamine, and an unstable base which reduces Fehling's solution. When diphenylnitrosamine and hydroxylamine, in molecular quantities, were boiled in methyl alcohol solution, either in the presence or absence of free alkali, nitrous oxide was given off in theoretical quantity. As no hyponitrites were formed the reaction can be explained only by assuming the direct decomposition of an addition-product of the following formula :



From the above it is seen what limits exist for the stability of pentavalent nitrogen. A marked contrast in the chemical nature of a part of the five substituting groups is necessary to insure stability.

On Paramethoxyorthosulphobenzoic Acid and Some of Its Derivatives. By P. R. Moale. *Am. Chem. J.*, **20**, 288–298.—*p*-Methoxy-*o*-sulphobenzoic acid was prepared by the method of Parks (*Am. Chem. J.*, **15**, 320). In the treatment of *p*-methoxybenzoic sulphinide with dilute hydrochloric acid the free acid was formed and not the ammonium salt, which is the chief product of the reaction when benzoic sulphinide is decomposed by dilute acids. From the acid the neutral and acid calcium, magnesium, and lead salts and the acid potassium salt were prepared. Sulphonfluoresceïns were made by the action of resorcinol, orcinol, and phenol on the acid, but were not obtained in pure condition.

Decomposition of Paradiazoorthotoluenesulphonic Acid with Absolute Methyl Alcohol in the Presence of Certain Substances. By P. R. Moale. *Am. Chem. J.*, **20**, 298–302.—When *p*-diazo-*o*-toluenesulphonic acid was decomposed by methyl alcohol in the presence of sodium methylate, the hydrogen reaction took place to a small extent, whereas with the alcohol alone only the methoxy product is formed. When the decomposition of the diazo compound was effected in the presence of sodium ethylate or potassium hydroxide, tarry masses were obtained from which no pure compounds could be isolated. With dry ammonia gas in methyl alcohol *p*-toluidine-*o*-sulphonic acid was obtained.

Parabenzoyldiphenylsulphone and Related Compounds. By Lyman C. Newell. *Am. Chem. J.*, **20**, 302–318.—*p*-Toluenesulphone chloride was converted by means of the Friedel-Crafts reaction into *p*-tolylphenylsulphone, which was oxidized by

chromic acid to *p*-phenylsulphonebenzoic acid. This acid forms well-characterized calcium, barium, and sodium salts and an acid chloride from which an amide and an anilide were prepared. *p*-Phenylsulphonebenzoyl chloride condenses with benzene in the presence of aluminium chloride forming *p*-benzoyldiphenylsulphone, a compound analogous to the one obtained in the same way by Remsen and Saunders (*Am. Chem. J.*, 17, 362) from the chlorides of *o*-sulphobenzoic acid. The para sulphone, unlike the corresponding ortho compound, is not decomposed into benzoic acid and diphenylsulphone when fused with potassium hydroxide. On the other hand it does yield a hydrazone and an oxime.

Derivatives of Silicon Tetrachloride. By Joseph F. X. Harold. *J. Am. Chem. Soc.*, 20, 13–29.—With a view to developing some new analogies between the behavior of silicon tetrachloride and that of the tetrachlorides of the other elements of the fourth group in the periodic classification of the elements, its action on nitriles and aromatic amines was studied. It was found, however, that silicon tetrachloride did not react with hydrocyanic acid, benzonitrile, acetonitrile, tolunitrile, succinonitrile, chlorcyanogen, sulphur dichloride, nitrogen dioxide, or the chlorides of phosphorus, whereas the tetrachlorides of tin and titanium enter into reaction with these substances. Silicon tetrachloride and aniline gave a substance of the composition $SiCl_2(C_6H_5NH)_2$. With *o*-toluidine an analogous compound was formed. The chloride with benzamide gave benzaldehyde and with acetamide acetonitrile.

Preliminary Note on Some New Derivatives of Vanillin. By A. E. Menke and W. B. Bentley. *J. Am. Chem. Soc.*, 20, 316–317.—By the action of sodium amalgam on chlorvanillin chlorvanilloin was formed. Nitric acid and vanillin yield three products: dinitroguiacol; a substance, which by further treatment with acid gives dinitroguiacol, and by oxidation with potassium permanganate nitrovanillic acid; and an unknown substance which was not identified. Tetrachlorpyrocatechin was formed when chlorine was passed into an alcoholic solution of pyrocatechuic acid.

Atropine Periodides and Iodomercurates. By H. M. Gordin and A. B. Prescott. *J. Am. Chem. Soc.*, 20, 329–338.—The conditions necessary for the formation of atropine enneaiodide were determined and applied to the volumetric estimation of the alkaloid. Atropine penta- and triiodide were also obtained. Double salts of the formulæ $C_{17}H_{23}NO_3HI.HgI_2$ and $(C_{17}H_{23}NO_3HI)_2.HgI_2$ were prepared and analyzed.

Chemical Bibliography of Morphine, 1875–1896. By H. E. Brown. *Pharm. Archives*, 1, 49–68.—This is a continuation of a bibliography of morphine, the appearance of which has already been noticed (*this Rev.*, 4, 13).

Alkyl Bismuth Iodides. By A. B. Prescott. *Pharm. Rev.*, 15, 219–220.—See *this Rev.*, 4, 49.

Formaldehyde. By George L. Taylor. *Am. J. Pharm.*, 70, 195–201.—The author gives a brief review of the methods of preparation and analysis and of the uses of formaldehyde.

[CONTRIBUTION FROM THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY.]

REVIEW OF AMERICAN CHEMICAL RESEARCH.

VOL. IV. No. 8.

ARTHUR A. NOYES, Editor; HENRY P. TALBOT, Associate Editor.
REVIEWERS: Analytical Chemistry, H. P. Talbot and W. H. Walker; Biological Chemistry, W. R. Whitney; Carbohydrates, G. W. Rolfe; General Chemistry, A. A. Noyes; Geological and Mineralogical Chemistry, W. O. Crosby; Inorganic Chemistry, Henry Fay; Metallurgical Chemistry and Assaying, H. O. Hofman; Organic Chemistry, J. F. Norris; Physical Chemistry, H. M. Goodwin; Sanitary Chemistry, E. H. Richards; Technical Chemistry, A. H. Gill and F. H. Thorp.

GENERAL AND PHYSICAL CHEMISTRY.

A. A. NOYES, REVIEWER.

Electrical Disturbance in Weighing. BY H. K. MILLER. *J. Am. Chem. Soc.*, **20**, 428–429.—The author finds that a flask wiped with a dry cloth shows an apparent increase in weight (in one case as much as 0.08 gram), and attributes this to the production of an electrical charge upon it, which induces an opposite charge in the floor of the balance case.

On the Speed of Coagulation of Colloid Solutions. BY C. E. LINEBARGER. *J. Am. Chem. Soc.*, **20**, 375–380.—The author concludes from his experiments with ferric hydroxide, silicic acid, and egg albumen, that coagulation started in one part of a colloid solution does not necessarily spread through the whole body of it, and that therefore it is very improbable that colloid solutions are comparable with supersaturated solutions of crystalline substances.

The Decomposition of Sulphonic Ethers by Water, Acids and Salts. BY J. H. KASTLE, PAUL MURRILL AND JOS. C. FRAZER. *Am. Chem. J.*, **19**, 894–901.—The ethyl ether of *p*-brombenzenesulphonic acid was dissolved in an excess of acetone, and 50 times the theoretical quantity of water in one case, and of alcohol in another, required for the saponification, was added to it; portions of these mixtures were heated in sealed tubes at 98° for different lengths of time (from 20 to 120 minutes), and the percentage decomposed was determined by titration with potash. Good velocity-constants of the first order were obtained, that for water being 3.5 times that for alcohol. It was found that acids and neutral salts, instead of merely acting catalytically, entered into a metathesis, the ethyl radical of the ester

uniting with the acid radical of the acid or salt. The saponification and metathesis therefore occur simultaneously; and the authors have determined, at the ordinary and at the boiling temperature, the amount of each taking place in the presence of the three halogen acids, of potassium iodide, and of calcium and magnesium chlorides, 1 cc. of a normal or a half-normal solution of these substances being added to 4 cc. of an acetone solution of the ester. In almost all cases, the amount undergoing metathesis greatly exceeded that undergoing saponification. The authors regard the occurrence of the metathetical reaction as a new characteristic distinguishing the esters of sulphonic acids from those of the carbonic acids, in which latter, mineral acids in aqueous solution simply accelerate saponification. It seems quite probable, however, that the difference in behavior is due to the difference in the solvents, acetone being used for the sulphonic esters and water for the carbonic esters.

A Determination of the Atomic Weight of Praseodymium and of Neodymium. By HARRY C. JONES. *Am. Chem. J.*, **20**, 345–358.—The material for the determination of the atomic weight of praseodymium was prepared by crystallizing 1¼ kilos of fairly pure ammonium praseodymium nitrate presented by the Welsbach Light Company twenty-one times from a nitric acid solution, only the middle portion from each crystallization being taken. The metal was then precipitated by adding oxalic acid to the hot solution, in order to remove traces of iron, calcium, etc. The oxalate so obtained was found spectroscopically to contain only 0.06 per cent. of neodymium; but as traces of cerium and lanthanum were still present, the oxalate was ignited, the oxide dissolved in nitric acid, and the solution evaporated and poured into hot water, when a cloud of basic cerium nitrate separated. To remove the lanthanum, the double nitrate was again formed and recrystallized repeatedly from very strong nitric acid. Finally the metal was again precipitated as the oxalate, which was ignited forming the peroxide, and this was heated in hydrogen to reduce it to sesquioxide. The atomic weight determinations were made by adding concentrated sulphuric acid to the oxide in a platinum crucible, and heating it first gently and then above the boiling-point of the acid in an air-bath to a constant weight. In the case of neodymium, the methods used for purifying the material (which was obtained in the form of the double nitrate of ammonium and neodymium from the same source) and for determining the atomic weight of the element were almost identical with those just described. The average of twelve closely agreeing determinations was 140.45 in the case of praseodymium, and 143.60 in that of neodymium. It is remarkable that the values given by

von Welsbach both differ from these by about three units and would agree well with them if interchanged, his values being 143.6 for praseodymium and 140.8 for neodymium.

On the Taste and Affinity of Acids. By J. H. KASTLE. *Am. Chem. J.*, 20, 466–471.—The author found by experiments with nineteen different acids in $\frac{1}{50}$ normal solution on seventeen persons that in the great majority of cases one acid was pronounced more or less sour than another according as the affinity constant of the one was greater or less than that of the other.

The Equilibria of Stereoisomers, I and II. By WILDER D. BANCROFT. *J. Phys. Chem.*, 2, 143–158; 245–255.—These papers discuss from a qualitative standpoint the application of the Law of Mass Action and the principle of freezing-point lowering to the equilibrium existing between two stereoisomers which undergo transformation into one another. In the first paper, the effect on the freezing-point of heating each of the stereoisomers by itself is considered; it is evident that a short heating will cause a lowering of the freezing-point of both of the pure compounds, owing to the formation of some of the other stereoisomeric modification; longer heating, near the melting temperature, will cause a further lowering, increasing in the case of one modification continuously until the liquid has the composition corresponding to the equilibrium-condition of the two stereoisomers, after which no further change in freezing-point occurs; while, in the case of the other modification, the freezing-point will steadily decrease on continued heating as long as it separates as a solid from the solution, but will suddenly begin to rise as the solution becomes so concentrated in the first modification as to cause *it* to separate, and will continue to rise until the former constant freezing-point corresponding to equilibrium is attained. In the second paper the effect is considered of the addition of a third substance not reacting chemically with the stereoisomers, for example, of the addition of a solvent. The author cites from the work of previous investigators numerous examples of some of the cases considered, showing them to be in accordance with his conclusions.

Acetaldoxime. By HECTOR R. CARVETH. *J. Phys. Chem.*, 2, 159–167. **Benzilorthocarboxylic Acid.** By C. A. SOCH. *J. Phys. Chem.*, 2, 364–370. **The Benzoyl Ester of Acethydroxamic Acid.** By FRANK K. CAMERON *J. Phys. Chem.*, 2, 376–381.—These articles are descriptions of experimental investigations of the stereoisomeric transformation of the substances mentioned in the titles along the lines indicated in the preceding review.

Naphthalene and Aqueous Acetone. By HAMILTON P. CADY. *J. Phys. Chem.*, 2, 168–170.—Naphthalene in excess was added to seven different mixtures of acetone and water, and the composition of the solution was determined at the temperature at which it resolved itself into two liquid layers, the temperature being also noted.

Indicators. By JOHN WADDELL. *J. Phys. Chem.*, 2, 171–184.—The author shows that the addition of ether, benzene, or chloroform, and in some, but not in all cases, also of alcohol or acetone, to aqueous or alcoholic solutions in which the indicators fluorescein, phenacetolin, phenolphthalein, paranitrophenol, cyanine, methyl orange, turmeric, lacmoid, and corallin are present in the form of their salts causes a change in color to that of the free acid or base. This change of color takes place much more readily when the indicator is present in the form of its acetate than when in that of its hydrochloride, and when in the form of its ammonium salt than when in that of its potassium salt. The author apparently considers that the change of color is most probably explained by the assumption that the electrolytic dissociation of the salt to whose ion the color is due is greatly reduced by the organic solvents; but at the close of the article he raises two objections to this hypothesis; namely, first, that it is then necessary to assume that the undissociated indicator salt and acid or base of the indicator have just the same color in all the cases investigated; and, second, that the hypothesis does not offer any explanation of the fact that the salts of weak acids (acetic) or bases (ammonia) undergo the change so much more readily than those of strong acids and bases (like hydrochloric acid and potash). These objections seem to the reviewer to warrant completely the rejection of the above explanation; and it appears to him that the following one, which is in part suggested by the author himself, is far more probable: the very weak acids and bases of which indicators consist, are so much less dissociated in organic solvents than in water, that their salts become nearly completely hydrolyzed when these solvents are added to the aqueous solutions of the salts, in spite of the fact that the concentration of the ions of the water is also reduced somewhat; hence the addition of the solvents liberates the free indicator acid or base, which exhibits its usual color, and it will, of course, liberate it much more readily if the other component of the salt is also a weak base or acid.—By noting whether the change of color occurred on adding the solvents to the acid solution, or to the alkaline solution of the indicator, or to both solutions, the author was able to determine whether it acts as a base or as an acid, or as both. He concludes from his experiments that phenolphthalein, parani-

trophenol, and turmeric are acids; that cyanine, methyl orange and lacmoid are bases; and that fluorescein, phenacetolin and corallin act both as acids and bases.

Benzene, Acetic Acid and Water. By JOHN WADDELL. *J. Phys. Chem.*, **2**, 233–241.—This investigation is a continuation of the so-called "Mass Law Studies." See *this Rev.*, **3**, 75, 152. No general conclusions are reached.

Boiling-Point Curve for Benzene and Alcohol. By E. F. THAYER. *J. Phys. Chem.*, **2**, 382–384.—The author has determined by means of a molecular weight apparatus the boiling-point of various mixtures of benzene and alcohol. The boiling-point of benzene, 79°.5, was found to be lowered very rapidly by the first additions of alcohol, reaching 69° when seven per cent. of it was added. The boiling-points of the mixtures then remained fairly constant—between 69° and 67°—until about 70 per cent. of alcohol was present, after which they rose gradually up to that of pure alcohol, 78°. No reference is made to the extended investigations of Konowalow (*Wied. Ann.*, **14**, 34, 219) in a similar direction.

Molecular Weights of Liquids. By CLARENCE L. SPEYERS. *J. Phys. Chem.*, **2**, 347–361; 362–363.—The case of two miscible liquids, both of which have appreciable partial vapor-pressures, is considered with reference to the relation between the change in partial pressure of one liquid and the concentration of the other (expressed as the ratio of the number of mols of it to the total number present). Where proportionality exists between these two quantities, the author concludes that no association of molecules occurs. Where it does not exist, he thinks that there are errors in the observations or that association takes place.

H. M. GOODWIN, REVIEWER.

Spectroscope without Prisms or Gratings. By A. A. MICHELSON. *Am. J. Sci.*, **155**, 215–217.—As is well known, the resolving power of a grating is proportional to the product of the total number of lines by the order of the spectrum observed. The great efficiency of the best modern gratings is due to the former factor almost exclusively, spectra of a higher order than the second or third being rarely observed. In the very beautiful device described by the author, the second factor is made of paramount importance, the spectra observed being of the order of several thousand. This is effected by observing the transmission spectrum produced by passing a beam of light from a collimater through a series of overlapping optically plane rectangular blocks of glass of equal thickness. These blocks must all be so nearly optically perfect that the accumulated error in

the difference of path of light passing through the whole system shall not be a half wave-length. A system consisting of twenty elements 5 mm. thick would have a resolving power of 100,000, about equal to that of the best gratings. The great advantage of this arrangement over ordinary gratings is that all spectra are superimposed in a very high order, consequently the maximum possible brilliancy is obtained. The Zeeman effect was easily observed with an instrument constructed with but seven elements.

On the Surface Tension of Liquids under the Influence of Electrostatic Induction. By SAMUEL J. BARNETT. *Phys. Rev.*, 6, 257–285.—The author has employed the beautiful method of ripples as perfected recently by Dorsey for investigating the change of surface tension of liquids with their degree of electrification, with the object of ascertaining whether the phenomenon is better explained by Helmholtz and Lippmann's or by Warburg's theory. The apparatus was modified in some details. Contrary to expectation, it was found that measurable effects could be produced only by very high electrification. This was affected by making the liquid surface one plate of an air condenser, the other being of glass coated with tin-foil and grounded. A Holtz machine served to charge the system. The potential was measured by applying the whole potential difference to the terminals of two condensers of known capacity, connected in series, and measuring the potential difference between the plates of one of them by means of a quadrant electrometer. Mercury and water were the two liquids investigated. It was found in all cases that the effect of electrification was to diminish the surface tension. The diminution was much greater in the case of water than in the case of mercury, but in both cases it was independent of the sign of the charge. A similar diminution in the apparent surface tension of water was also noted when alternating charges from the secondary of an induction coil was used. The author regards these results as being in accord with Helmholtz "charge" theory, but in disagreement with any electrolytic hypothesis. He points out, however, that the effect may possibly be wholly due to electrostatic actions in the liquid and not to "forces tangential to the surface acting between the elementary electric charges."

Normal Elements. By D. MCINTOSH. *J. Phys. Chem.*, 2, 185–193.—Experiments were made with numerous cells, mostly of the Clark type, for the purpose of obtaining one with an electromotive force of about 0.5 volt and suitable for a standard of reference. The most promising consisted of $Pb/PbCl_2$, $ZnCl_2/Zn$. This cell has an electromotive force of 0.5 volt at 20° when the

zinc chloride solution has a gravity of 1.23. Its temperature coefficient between 0° and 20° was found to be 0.0001 volt per degree. The electromotive force E in volts of the cell $Cu/saturated\ CuSO_4, Hg_2SO_4/Hg$ was found to be as follows: $E = 0.3613 + 0.0006\ [16.5° - t°]$. A $Pb/PbCl_2$, HgCl/Hg cell failed to give satisfactory results. The attempt to reduce the effect of mechanical disturbances by the use of the agar-agar jelly proved unsuccessful with concentrated copper sulphate.

The Transference Number of Hydrogen. By Douglas McIntosh. *J. Phys. Chem.*, **2**, 273–289.—The method chosen for determining this quantity was that suggested by von Helmholtz and based on his theory of concentration cells. If the electromotive force of two cells of the type $Zn/ZnSO_4, Hg_2SO_4/Hg$ of different concentrations, connected in opposition, that is, mercury to mercury, be compared with the electromotive force of the corresponding ordinary diffusion cell, $Zn/ZnSO_4$ concentrated, $ZnSO_4$ dilute/Zn, it is easy to show that the ratio of the former to the latter is equal to $\frac{v}{u+v}$, Hittorf's transference ratio. In order to determine the ratio for hydrogen in various acids, the electromotive force of gas batteries, with hydrogen electrodes, both with diffusion and without, was determined. Poggendorff's compensation method with the Lippmann electrometer was used for making the measurements. The mean value of the ratio $\frac{v}{u+v}$ was for hydrochloric acid 0.159, hydrobromic acid 0.158, hydriodic acid 0.161, sulphuric acid 0.174, and oxalic acid 0.163. The observed values of which the above are the mean were nearly independent of the dilution which varied from 1 to 1000 liters. This, together with the fact that the above values are much lower than Hittorf's values, leads the author to conclude that the method is inapplicable to gas cells, owing possibly to the solubility of hydrogen in the electrolyte. Certain other measurements on concentration cells with chlorine, bromine and iodine electrodes, led to results of no particular importance.

Single Differences of Potential. By Hector R. Carveth. *J. Phys. Chem.*, **2**, 289–322.—The object of this research "is to examine the theories of to-day with respect to single differences of potential ....., and to attempt to answer the question, Do these methods give the true potential difference?" A consideration of the theories of Helmholtz and of Warburg leads to the conclusion that an ideal dropping electrode is not realized in practice, owing to the fact that the dropping mercury does not assume in any case its maximum surface tension when falling into an electrolyte. Certain apparently discordant results of

Paschen lead the author to think that no potential difference between metal and liquid is accurately known. Notwithstanding his criticism of the dropping electrode method, the author makes use of it for investigating further the potential difference between a number of metals in solutions of their salts. It was found that fairly constant measurements could be obtained when the mercury broke below the surface of the liquid, but that the actual values varied widely with the adjustment of the electrode. A steady variation of potential with the dilution was observed in certain cases, but a comparison with the values computed from Nernst's theory was not satisfactory. Measurements of the potential difference between Hg/HgCl, KCl and between Hg/KCl agree well, if in the latter case the electrode was allowed to stand some time in contact with the electrolyte. In certain cases, contrary to Paschen's results, the potential difference was found to vary with the nature of the cation. Experiments on irreversible electrodes confirmed the results of Warburg and Paschen as to the effect of oxygen on the electrodes. Rothmund's results on the potential difference of amalgams are criticised, and the general conclusion is drawn from the whole investigation that "neither on the ground of Helmholtz's theory, nor that of Warburg, nor that of Nernst is there reason for regarding one single potential difference known."

Study of a Three-Component System. By HECTOR R. CARVETH. *J. Phys. Chem.*, **2**, 209–229.—The author has determined the freezing-points of mixtures of lithium, sodium, and potassium nitrates, taken in pairs, and also when all three were simultaneously present. The measurements were made with a mercury thermometer, and an accuracy greater than one or two degrees was not attempted. The results are discussed graphically by the triangular diagram of Roozeboom, and the regions representing systems of different variance are determined. An approximate computation of the molecular weight of one inorganic salt dissolved in another, from the lowering of the melting-point produced, shows it to be much lower than ordinarily assumed, and to be largely dependent on the concentration.

Note on Thermal Equilibrium in Electrolysis. By D. TOMMASI. *J. Phys. Chem.*, **2**, 229–232. From the decomposition-products observed in the electrolyses of solutions of several nitrates, nitrites, chlorates, sulphates, arsenates and arsenites between platinum electrodes placed very close together, the author concludes: "First, when a substance is submitted to two equal and contrary chemical actions, the reaction which involves the most heat will take place in preference, provided always that it can begin. Second, of two chemical reactions, that one which requires less heat to start it will always take place in

preference, even though it evolves less heat than the other reaction."

The Specific Heat of Anhydrous Liquid Ammonia. By LOUIS A. ELLEAU AND WILLIAM D. ENNIS. *J. Franklin Inst.*, 145, 189–214; 280–294.—The authors obtain the value 1.0206 for the mean specific heat of liquid ammonia between 0° and 20°. This is the mean of nine determinations made by the method of mixtures. The liquid ammonia, about 12 grams, was contained in a closed steel cylinder, and was initially cooled in a chamber surrounded by ice to nearly 0° before immersion in the calorimeter. The ammonia used was once distilled from the commercial product.

ANALYTICAL CHEMISTRY.

ULTIMATE ANALYSIS.

H. P. TALBOT, REVIEWER.

The Moist Combustion Method of Determining Carbon. By GEORGE AUCHY. *J. Am. Chem. Soc.*, 20, 243–253.—The data given in this article indicate that, in the moist combustion method, a single potash bulb containing a potash solution of 1.27 sp. gr. is insufficient to insure the complete retention of the carbon dioxide evolved, and the substitution of a solution of 1.40 sp. gr. does not always obviate the necessity for a second potash bulb. It is also shown that a change in weight of the bulbs, due to loss or gain of moisture, must be carefully guarded against. The author finds the occasional absorption by the potash bulbs of some chloro-chromic compound which passes the purifying train, the most serious source of error in this procedure.

Electrolytic Determinations. By EDGAR F. SMITH AND DANIEL L. WALLACE. *J. Am. Chem. Soc.*, 20, 279–281.—The authors confirm statements previously made regarding the electrolytic determination of uranium (*Am. Chem. J.*, 1, 329), and cadmium (*this Rev.*, 4, 30). They also controvert the statements of Heidenreich (*Ber.*, 29, 1587), who claims to have found their previous directions to be inaccurate.

Boric Acid Determination. By THOMAS S. GLADDING. *J. Am. Chem. Soc.*, 20, 288–289.—The procedure includes the distillation of the boric acid in the presence of sirupy phosphoric acid and methyl alcohol. The acid is titrated in the distillate after the addition of glycerine. A cut shows the details of the apparatus employed.

On the Determination of Potash without the Previous Removal of Iron, Cadmium, Etc. By C. C. MOORE. *J. Am. Chem. Soc.*, **20**, 340–343.—The usual procedure is much shortened by the addition of the hydrochloroplatinic acid to the acid solution of the substance, after filtration from any insoluble residue. The platinum compound is added only in sufficient quantity to combine with the potash, and, after evaporation almost to dryness, the double potassium-platinum salt is washed with acidulated alcohol (made by passing dry hydrochloric acid gas into cool ninety per cent. alcohol), then with ammonium chloride solution and finally with eighty-five per cent. alcohol. The double salt is then dried and weighed. Ammoniacal salts must first be destroyed.

Analytical Notes upon the Estimation of Phosphorus in Steel. By R. W. MAHON. *J. Am. Chem. Soc.*, **20**, 429–453.—The molybdate-magnesia method for the determination of phosphorus in steels is critically examined by the author, and experimental data are given in profusion. A table of contents at the opening of the paper shows the division and scope of the subject-matter.

The Colorimetric Estimation of Small Amounts of Chromium, with Special Reference to the Analysis of Rocks and Ores. By W. F. HILLEBRAND. *J. Am. Chem. Soc.*, **20**, 454–460.—The rock or ore is fused with sodium carbonate and nitrate, the manganese reduced by methyl or ethyl alcohol, the silica and aluminum removed (and re-examined for chromium), and if the amount of chromium is very small, mercurous nitrate added to throw down phosphoric, vanadic, chromic and carbonic acids in combination with mercury. This precipitate is ignited and the residue fused with sodium carbonate and the color of the solution compared with that of a standard chromate solution, made alkaline with sodium carbonate. Details as to apparatus are given in the original paper. The procedure exceeds in accuracy the usual gravimetric process.

Volumetric Estimation of Vanadium in Presence of Small Amounts of Chromium, with Special Reference to the Analysis of Rocks and Ores. By W. F. HILLEBRAND. *J. Am. Chem. Soc.*, **20**, 461–465.—The rock or ore is treated exactly as described in the preceding review for the colorimetric estimation of chromium. The chromate solution may then be made acid with sulphuric acid and the chromic and vanadic acids reduced by sulphurous acid gas, the excess being expelled by boiling. The vanadium is then determined by titration with potassium permanganate. A considerable quantity of chromium, or the presence of arsenic or molybdenum, interferes with the titration.

[CONTRIBUTION FROM THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY.]

REVIEW OF AMERICAN CHEMICAL RESEARCH.

VOL. IV. NO. 9.

ARTHUR A. NOYES, Editor; HENRY P. TALBOT, Associate Editor.
REVIEWERS: Analytical Chemistry, H. P. Talbot and W. H. Walker; Biological Chemistry, W. R. Whitney; Carbohydrates, G. W. Rolfe; General Chemistry, A. A. Noyes; Geological and Mineralogical Chemistry, W. O. Crosby; Inorganic Chemistry, Henry Fay; Metallurgical Chemistry and Assaying, H. O. Hofman; Organic Chemistry, J. F. Norris; Physical Chemistry, H. M. Goodwin; Sanitary Chemistry, E. H. Richards; Technical Chemistry, A. H. Gill and F. H. Thorp.

TECHNICAL CHEMISTRY.

F. H. THORP, REVIEWER.

The Protection of Steam-Heated Surfaces. BY C. L. NORTON. *Engineer*, *No.* 459, 165.—This investigation was made in order to show the relative efficiency of various kinds of steam-pipe covering now on the market, to ascertain the fire risk attendant upon the use of certain methods and materials for insulating steam-pipes, and to show the gain in economy attendant upon increase in thickness of coverings. A piece of steam-pipe was electrically heated from the inside, the electrical energy supplied was measured, and the amount of heat furnished was calculated. By keeping the pipe at a constant temperature, the amount of heat supplied is obviously equal to the heat lost by radiation, convection, and conduction. The pipe, closed at one end by a welded-in plate and at the other by a tight cover, was filled with heavy cylinder oil, into which the heating coil, an effective stirrer, and a thermometer, were introduced. The apparatus was suspended in the middle of a room, by non-conducting cords, and the thermometer was read by a telescope, the observer being at a distance to avoid the production of air currents and the addition of heat from the person. Fourteen different samples were tested, the best results being obtained with a covering composed of granulated cork pressed in a mould and rendered non-combustible by a fire-proofing process. Nearly as good was a covering composed of 90 per cent. magnesium carbonate. A cover made of thin sheets of asbestos paper, separated from one another so as to enclose a considerable amount of air, was also very effective. Asbestos, when not porous and not containing entrapped air, is a good conductor of heat. Carbonate and sulphate of calcium are not good heat insulators. Cov-

erings containing wool, hair-felt, or wool-felt, have high efficiency as non-conductors, but are considered dangerous on account of fire risks. Computations of the money saving effected by covers, show that in general a cover pays for itself in a little less than a year of 310 ten-hour days; or in four months, working 365 days of twenty-four hours each. As a protection to wooden surfaces, an asbestos board, made of corrugated asbestos paper sheets cemented with sodium silicate, was found very effective, though not remarkable as a non-conductor of heat.

Sadtler's Reducing Agent. *Leather Manufacturer*, **9**, 105.—These are merely general remarks upon the use of hydrogen peroxide as a reducing agent for chrome tanned skins (see *this Rev.*, **2**, 106). A slightly acid bath is used, the peroxide being added in successive small portions.

Commercial "Moellon" Degras. *Leather Manufacturer*, **9**, 110.—Moellon is a degras made by the oxidation of cod or fish oil in the pores of skins from which the degras is then pressed. Abstracts of the various methods for preparing moellon, with a few remarks upon its use in tanning, make up the larger part of this article.

The Liming of Soils. By H. J. Wheeler. *U. S. Dept. Agr., Farmers' Bull. No.* 77.—This bulletin gives a popular exposition of the theory and practice of using lime as a fertilizer. The various materials employed are described and their relative values compared. Many of the conclusions are drawn from the results of experiments at the Rhode Island Experiment Station where the author is the chemist.

Commercial Fertilizers. *N. Y. State Sta. Bull.*, **129**, 351–421; *Miss. Sta. Special Bull.*, **42** and **45**; *La. Sta. Bull.*, **49**, 163–198; *R. I. Sta. Rep.*, *1896*, 211–220; *N. J. Bull.*, **124**, 48; *Ark. Sta. Rep.*, *1897*, 101–118; *Md. Sta. Bull.*, **49**, 105–160; *Pa. Dept. Agr. Bull.*, **33**; *Vt. Sta. Rep.*, *1896–97*, 28–30; *Ga. Dept. Agr. Bull.*, **33**, 116; *Me. Sta. Bull.*, **38**.

The Control of the Temperature in Wine Fermentation. By A. P. Hayne. *Cal. Sta. Bull.*, **117**, 19.—The causes of the spontaneous heating of fermenting must and methods of controlling it are considered in this bulletin. If the temperature exceeds 100° F. the wine ferment becomes inactive; but injurious bacteria continue to thrive. A method of cooling must, employed in France, is described, in which the must is pumped through several hundred feet of $1\frac{1}{2}$ inch piping arranged in columns and cooled externally by water dripping upon the pipes from a tank above them. At the California Experiment Station a column composed of flat tubes 4 by $1\frac{1}{2}$ inches is used, the total

length of pipe being only 43 feet. The pipes are cooled by a spray of water blown against them by a strong blast of air, the evaporation adding greatly to the cooling effect.

Petroleum Briquettes in Germany. By MAX BOUCHSEIN. *U. S. Consular Rep.*, **57**, 254.—This is a description of a process patented by J. Kohlendorfer, by which petroleum refuse is worked into a solid substance for a cheap fuel. Soda lye and a saponifiable fat (such as tallow) are heated with superheated steam with exclusion of air until the saponification begins and then a fourfold quantity of petroleum refuse is added, and the mixture heated about an hour, with constant stirring, but keeping the temperature below the boiling-point of the petroleum. The mixture is then run into molds and solidifies on cooling. Coal-dust, saw-dust, or other combustibles may be added during the process if desired. The grease may be replaced by resin or resin acid if a harder product is desired. The product contains about 80 per cent. of petroleum oil and only 5 per cent. of non-combustible matter.

GEOLOGICAL AND MINERALOGICAL CHEMISTRY.

W. O. CROSBY, REVIEWER.

Auriferous Conglomerate of the Transvaal. By GEO. F. BECKER. *Am. J. Sci.*, **155**, 193–208.—The auriferous conglomerate of the Witwatersrand gold field constitutes the most important gold deposit ever known. A strip of country a couple of miles in width and about 30 miles in length has yielded since 1887 about $240,000,000, and only about one-fifteenth of the accessible gold has been extracted. The nature of this wonderful deposit is a subject of manifest interest to geologists and mining engineers, who, however, have arrived at various conclusions. No considerable doubt exists that the conglomerate is a marine littoral deposit, but some observers have held that the gold is detrital, being an original part of the conglomerate; others that it is a chemical precipitate from the ocean in which the pebbly beds were laid down; and still others that the precious metal reached the uplifted but uncemented gravel in solution, so that the ore-bearing strata are allied to ordinary veins. After presenting all the more striking facts which it is necessary to consider in testing the theories propounded to account for the deposition of gold on the Rand, the author rigidly tests each theory by the facts and reaches the conclusion that the deposition of the gold was in no sense chemical, that there are no valid objections to the theory of marine placer origin, and that no noteworthy features are left unexplained by this theory. The argu-

ment is so clear and cogent that the detrital theory of the Transvaal gold may be regarded as firmly established.

San Angelo Meteorite. By H. L. Preston. *Am. J. Sci.*, **155**, 269–272.—This describes a metallic meteorite found in 1897, in Tom Green County, Texas. It weighed 194 pounds, and is distinguished by unusually perfect octahedral structure, the comparative scarcity of troilite, and the sharpness and regularity of the Widmanstätten figures. Analysis shows: Fe, 91.958; Ni, 7.860; and traces of Co, Cu, P, S, Si, and C.

On Clinohedrite, a New Mineral from Franklin, N. J. By S. L. Penfield and H. W. Foote. *Am. J. Sci.*, **155**, 289–293.—This is a monoclinic hydrous silicate of zinc and calcium. The crystals are especially interesting, as they belong to that division of the monoclinic system characterized by a plane of symmetry but not an axis of symmetry. The theoretical composition as deduced from two analyses is: SiO_2, 27.92; ZnO, 37.67; CaO, 26.04; H_2O, 8.37; total, 100.00. This corresponds very nearly to the ratio 1 : 1 : 1 : 1, giving the formula $H_2ZnCaSiO_5$, analogous to that of calamine. The formula may also be written $(ZnOH)(CaOH).SiO_4$; and that hydroxyl is present is proved by the fact that water is not expelled much below a faint redness.

On Rhodolite, a New Variety of Garnet. By W. E. Hidden and J. H. Pratt. *Am. J. Sci.*, **155**, 294–296.—This garnet, found in a very limited area in Macon County, North Carolina, is distinguished by its strikingly beautiful rose tints; its surprisingly small amount of coloring-matter; its gem-like transparency; its freedom from internal imperfections; and its remarkable brilliancy when cut as a gem. As yet it is known only as rolled pebbles and fragments in gravel. Analysis gives: SiO_2, 41.59; Al_2O_3, 23.13; Fe_2O_3, 1.90; FeO, 15.55; MgO, 17.23; CaO, 0.92; total, 100.32. The ratio of protoxide, sesquioxide and silica is nearly 3 : 1 : 3, which classifies the mineral as one of the garnets. The ratio of MgO to FeO is almost exactly 2 : 1, which would indicate that the mineral is composed of two molecules of a magnesium-aluminum garnet (pyrope) and one molecule of a ferrous iron-aluminum garnet (almandite). The theoretical composition is calculated for this ratio and the formula deduced.

Some Lava Flows of the Western Slope of the Sierra Nevada, California. By F. Leslie Ransome. *Am. J. Sci.*, **155**, 355–375.—The lavas here described occur in the valley of the Stanislaus river and are of later date than the rhyolite and the andesitic breccias and tuffs of the region. The distinctive chemical

feature of these rocks is a rather high percentage of total alkalies, with the potash somewhat in excess of the soda. Chemically they stand between typical andesites and typical trachytes, and belong to a group which it seems necessary to classify under a new name, and they are here called *latite*. Three successive flows are recognized, the first of which, the Table Mountain flow, extended a distance of at least twenty miles. The first and third flows are augite-latite, and the second, biotite-augite-latite. Seven analyses are given, and many others of allied rocks are quoted in tabular form for comparison. The potash approximates 5 per cent., and yet the majority of the thin sections contain no recognizable potash-bearing mineral. Hence the author concludes that where biotite is absent the potash must exist in the residual glass of the ground mass. The classification of the latites is discussed at some length and their lithologic individuality definitely established.

On Krennerite, from Cripple Creek, Colorado. By ALBERT H. CHESTER. *Am. J. Sci.*, **155**, 375–377.—Krennerite has not previously been identified from this country. The mineral from Cripple Creek occurs in brilliant, orthorhombic crystals of a pale yellowish-bronze color, but tin-white on cleavage faces, and up to 2 mm. in length. An analysis by Prof. W. S. Myers gave, after deducting 1.21 per cent. of insoluble matter and calculating to one hundred: Au, 43.86; Ag, 0.46; Te, 55.68; corresponding to the formula $AuTe_2$, and agreeing very closely with sylvanite (monoclinic) and calaverite (triclinic).

Geology of the St. Croix Dalles. Part II.—Mineralogy. By CHAS. P. BERKEY. *Am. Geol.*, **21**, 139–155.—The article describes (p. 153) a greenish-yellow sulphate occurring as an efflorescence on the pyritiferous Dresbach shales. Analysis gave: SiO_2, 12.946; Fe_2O_3, 22.828; Al_2O_3, 4.141; K_2O, 1.844; Na_2O, 4.659; CaO, 2.210; SO_3, 32.500; H_2O, 17.840; organic matter, traces; total, 98.968 per cent. Although probably a mixed substance, as indicated by the high proportion of silica, it is similar in complexity and general range to voltaite.

Residual Concentration by Weathering as a Mode of Genesis of Iron Ores. By JAMES P. KIMBALL. *Am. Geol.*, **21**, 155–163.—After citing his previous papers on this subject, two of which have been noticed in this *Review*, the author describes a remarkable differential development of ferric and magnetic oxides from an amorphous basic aggregate on a tributary of the Yakima River, in the state of Washington. The ferruginous beds have a thickness of from six to eighteen feet; the chief occurrence of iron ores is at the base, where they overlie crystalline pyroxene; and here its development is confined to wet places

and exposed ledges. In circumstances thus favorable to atmospheric oxidation and percolation of water, magnetite, martite, hematite, and limonite have been exfoliated as an insoluble residuum from decomposition of the basic aggregate, with interlaminated siliceous residuums, to a thickness of from two to eighteen inches; while immediately beneath the basal pyroxene is to the depth of a few inches, commonly decomposed into a soft chloritic clay. The ferriferous zone fades out gradually upward, and the whole occurrence is economically insignificant and worthless. Seventeen partial analyses by Prof. James A. Dodge show a range in metallic iron from 15.36 to 63.05 per cent. The fixation of ferric oxide is believed to occur through reaction with calcic carbonate, which is also a product of the splitting up of basic silicates. The magnetite is not regarded as wholly residual, but due in part to stoichiometrical transformation of ferric hydrate at ordinary temperatures.

Brazilian Evidence on the Genesis of the Diamond. By Orville A. Derby. *J. Geol.*, **6**, 121–146.—This is a very complete summary of the facts afforded by the diamond washings of Brazil that have a bearing upon the origin of this gem; and a comparison with the evidence from the "dry diggings" of South Africa. The general conclusion reached is that as the case now stands the indications support the view of the formation of the Brazilian diamonds in the phyllites or associated sedimentary deposits through the active agency of neighboring eruptives which are in part pegmatitic, the carbon having been supplied by the phyllites. In order to bring the Kimberley and Brazilian modes of occurrence into line as phases of a single mode of genesis, it seems necessary to put aside the idea that the recent interesting experiments on the artificial production of the diamond afford a solution of its terrestrial origin, and that the Kimberley type of rock and mode of occurrence are essential features. Presumably, also, the genesis must be sought in the rocks affected by the eruptive masses rather than in those masses themselves; and hence the diamond is to be regarded as of metamorphic, and not of truly igneous origin.

[CONTRIBUTION FROM THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY.]

REVIEW OF AMERICAN CHEMICAL RESEARCH.

VOL. IV. NO. 10.

ARTHUR A. NOYES, Editor; HENRY P. TALBOT, Associate Editor.
REVIEWERS: Analytical Chemistry, H. P. Talbot and W. H. Walker; Biological Chemistry, W. R. Whitney; Carbohydrates, G. W. Rolfe; General Chemistry, A. A. Noyes; Geological and Mineralogical Chemistry, W. O. Crosby; Inorganic Chemistry, Henry Fay; Metallurgical Chemistry and Assaying, H. O. Hofman; Organic Chemistry, J. F. Norris; Physical Chemistry, H. M. Goodwin; Sanitary Chemistry, E. H. Richards; Technical Chemistry, A. H. Gill and F. H. Thorp.

INORGANIC CHEMISTRY.

HENRY FAY, REVIEWER.

The Action of Zinc on Copper Silicide. BY G. DE CHALMOT. *Am. Chem. J.*, **20**, 437–444.—In a previous paper (*this Rev.*, **4**, 40) it was shown that sulphur decomposes copper silicide with the liberation of free silicon. It is now shown that zinc acts in a similar manner, setting free crystalline silicon. With the addition of small quantities of zinc, there is no liberation of silicon, owing to the fact that the zinc combines with the free copper in the silicide. By varying the amounts of zinc it has been estimated that the combination of the zinc and copper ceases when the two elements are present in the proportion to form the compound $ZnCu_2$, so that for the same quantities of zinc there is more silicon liberated the smaller is the quantity of free copper in the silicide.

The Action of Sulphur upon Metallic Sodium. BY JAMES LOCKE. *Am. Chem. J.*, **20**, 592–594.—Sulphur in varying proportions dissolved in hot toluene, when brought into contact with sodium under boiling toluene, reacts to form a sulphide which, after washing with hot toluene, has approximately the composition expressed by the formula Na_2S_3. In two experiments where there was some residual sodium, it was bright and clear, showing that it was without action at this temperature on the polysulphide formed. At the temperature of melted naphthalene there was likewise combination; but there was no evidence in either case of the formation of sodium monosulphide.

On Some Compounds of Trivalent Vanadium. BY JAMES LOCKE AND GASTON H. EDWARDS. *Am. Chem. J.*, **20**, 594–

606.—The vanadates of sodium and ammonium were reduced by alcohol and hydrochloric acid to vanadyl dichloride, and this was further reduced to vanadium chloride by means of mercury amalgam in a special apparatus arranged so that all of the work could be carried out in a current of hydrogen. From vanadium hydroxide new salts were prepared so as to study the influence which the atomic weight exerts upon the development of the properties common to aluminum, chromium, manganese, iron, and cobalt. By evaporating *in vacuo* the green solution obtained by dissolving vanadium hydroxide in hydrochloric acid, crystals of the compound $VCl_3.6H_2O$ were obtained. This salt had previously been obtained by Piccini, but was not described by him. It is similar in composition and properties to the chloride of iron, aluminum, and chromium. Double salts could not be obtained from vanadium chloride and the alkali chlorides. The bromide, $VBr_3.6H_2O$, prepared in a similar manner, is described; but the iodide could not be obtained. Potassium vanadicyanide, $K_3V(CN)_6$, was prepared by dissolving the anhydrous chloride in as small a quantity of water as possible, and by adding to this an excess of a concentrated solution of potassium cyanide. From this solution the new compound was precipitated by the addition of alcohol. This salt forms a member of the series $K_3M(CN)_6$ and gives colored precipitates with solutions of inorganic salts. It was impossible to prepare the sodium and ammonium salts. Potassium vanadisulphocyanide, $K_3V(SCN)_6.4H_2O$, was made by bringing together vanadium trichloride and an alcoholic solution of potassium sulphocyanide and crystallizing in a vacuum. It crystallizes in dark-red crystals, which are readily soluble in water and alcohol, the solution, however, being extremely unstable.

On the Decomposition of Concentrated Sulphuric Acid by Mercury at Ordinary Temperatures. By CHARLES BASKERVILLE AND F. W. MILLER. *J. Am. Chem. Soc.*, **20**, 515–517.—The authors state that the acid used by them in previous experiments contained 99.65 per cent. H_2SO_4, and that it does react with mercury, notwithstanding the evidence to the contrary cited by Pitman. (*This Rev.* **4**, 41.)

BIOLOGICAL CHEMISTRY.

W. R. WHITNEY, REVIEWER.

Proteids of the Pea. By THOMAS B. OSBORNE AND GEO. F. CAMPBELL. *J. Am. Chem. Soc.*, **20**, 348–362.—The authors have discovered that the legumin of the pea, previously described by them, was contaminated with another proteid,

to which they have given the name vicilin; and that the purified legumin of the pea and of the vetch, lentil, and horse bean are probably identical. In the pea they recognize the following proteids: legumin, which is the non-coagulating globulin; vicilin, coagulable and relatively soluble; a globulin or albumin to which the name legumelin is given; protoproteose; and deuteroproteose. The results of analyses of these constituents and their properties are given.

Proteids of the Lentil. Proteids of the Horse Bean. Proteids of the Vetch. Proteids of the Soy Bean. By T. B. Osborne and G. F. Campbell. *J. Am. Chem. Soc.*, **20**, 362–375; 393–405; 406–410; 419–427.—In these four investigations the authors have followed the methods employed in the preceding one, and have arrived at conclusions concerning the composition of the nitrogen-containing components of these vegetables. They find legumin, legumelin, and proteose in the lentil, horse bean, and vetch, and vicilin in the lentil and horse bean. The soy bean contains as its chief proteid a globulin somewhat similar to the legumin found in the other vegetables examined, but of somewhat different composition. The soy bean also contains some legumelin and proteose.

The Proteids of the Pea, Lentil, Horse Bean, and Vetch. By T. B. Osborne and G. F. Campbell. *J. Am. Chem. Soc.*, **20**, 410–419.—The authors compare the compositions and properties of the legumin, vicilin, legumelin, and proteose which they have isolated from the vegetables mentioned in the title, and give the results of the application of the proteid tests upon these different constituents. The analyses of the four substances which they have obtained agree exceedingly well for the same substance from the different sources, while the differences between the compositions of the different proteids are very marked.

A. G. Woodman, Reviewer.

The Chemistry of Cascara Sagrada. By Alfred R. L. Dohme and Hermann Engelhardt. *J. Am. Chem. Soc.*, **20**, 534–546.—The authors have made a systematic analysis of a typical sample of cascara sagrada bark. They have obtained the volatile oil which gives to the drug its characteristic odor, and have also isolated a fixed oil which they regard as a mixture of dodecyl palmitate and dodecyl stearate. From the extract with eighty per cent. alcohol, was obtained the glucoside of cascara sagrada, which the authors have named purshianin. This is a dark brown-red crystalline substance which melts at 237° C., and yields emodin when saponified.

Nitrogenous Feeding Stuffs. By C. S. Phelps. *Storrs Agr. Expt. Sta. Bull.*, **18**, 1–16.—This bulletin describes a number of nitrogenous feeding stuffs, and contains tables showing their composition and nutritive value.

Mushrooms as Food. *U. S. Dept. of Agr., Farmers' Bull.*, **79**, 18-20—Tables are given comparing the composition of mushrooms with that of other articles of food. These show that edible fungi do not possess a high food value.

Evaporation and Plant Transpiration. By Walter Maxwell. *J. Am. Chem. Soc.*, **20**, 469–483.—The object of this investigation was to determine, first, the loss of moisture due to direct evaporation from the soil; and secondly, the relative proportion that escapes by transpiration from the sugar-cane (*saccharum officinarum*) during different periods of growth. The observations were made on considerable quantities of soil, 125 pounds in each case, and covered a period of eight months. The author considers that it is shown by the results that nitrogen, which was applied in the form of sodium nitrate, stimulates growth and causes increased transpiration, and also that nitrogen is the vital element in the growth of plants. The data obtained were found to be of value in practical field irrigation.

Some Spraying Mixtures. *Cornell Univ. Agr. Expt. Sta. Bull.*, **149**.—This bulletin contains analyses of some mixtures sold as insecticides, most of them being found to contain arsenic and copper.

The Value of Experiments on the Metabolism of Matter and Energy. By C. F. Langworthy. *U. S. Dept. Agr. Expt. Sta. Record*, **9**, 1003–1019.—The author discusses the value of metabolism experiments in comparison with ordinary feeding tests, and advocates a more general trial of such experiments at experiment stations.

The Mineral Constituents of the Tubercle Bacilli. By E. A. de Schweinitz and Marion Dorset. *J. Am. Chem. Soc.*, **20**, 618–620.—In continuation of their work upon the composition of the tubercle bacilli, the authors have made careful analysis of the ash. Quite noticeable were the high percentage of phosphorus pentoxide and the absence of other acid radicals. The high percentage of fat in the body of the tubercle bacilli, as previously observed, taken in connection with the high phosphate content of the ash, lead the authors to raise the interesting query as to whether, in prescribing phosphates and cod-liver oil in cases of tuberculosis, we are not supplying nourishment to the bacilli rather than to the individual.

A Volumetric Assay of Opium. By H. M. Gordin and A. B. Prescott. *Pharm. Archives*, 1, 121–126.—The method is based on the following plan: The opium alkaloids are set free by ammonia with alcohol, ether, and chloroform. The other alkaloids are removed by benzene, after which the morphine is taken out by percolation with acetone. After evaporation of the acetone the residue is taken up with lime-water, and the morphine is estimated by titration as periodide, according to the method of the authors (*J. Am. Chem. Soc.*, 20, 334). The procedure is described in considerable detail.

Note upon the Volumetric Assay of Opium. By H. M. Gordin and A. B. Prescott. *Pharm. Rev.*, 16, 303.—The authors have found that in the estimation of morphine as a periodide by their method, as described in the preceding review, the character of the precipitate obtained varies under certain conditions, which are now being studied.

Factory Tests for Milk. By S. M. Babcock, H. L. Russell, and J. W. Decker. *Wis. Agr. Expt. Sta. Bull.*, 67, 1–20.—This bulletin describes a number of simple tests that can be applied to determine the quality of the milk with regard to its use in the cheese industry. It gives a quite thorough description of the Wisconsin Curd Test as used for this purpose.

The Chemistry of Aloes. By Alfred R. L. Dohme. *Am. J. Pharm.*, 70, 398–402.—This paper is a summary of recent work on the subject, showing (1) that the resin of aloes is an ester varying with the kind of aloes; (2) that aloin contains emodin, to which its laxative property is probably due; and (3) that many drugs owe their laxative property to the substance emodin, which is probably a derivative of hydroquinone.

Analyses of Commercial Fertilizers. *Agr. Expt. Sta. Bull.*, *R. I.*, *No.* 48; *S. C.*, *No.* 35; *Vt.*, *Nos.* 63, 64, and 65; *Ky.*, *No.* 75; *Me.*, *No.* 43.

Valuation of Crude Carbolic Acid. By Carl E. Smith. *Am. J. Pharm.*, 70, 369–378.—As the result of a number of experiments, the author concludes that a modification of Koppeschaar's bromine test, and a test for alkali, are all that is required to determine the value of a sample for disinfecting purposes.

On the Determination of Fat and Casein in Feces. By Herman Poole. *J. Am. Chem. Soc.*, 19, 877–881.—The author considers methods of fat determination by extraction with ether faulty, because no attempt is made to separate the fat from the cholesterol, bile, and other products extracted. He effects this,

separation by saponifying the residue from the evaporation of the ether extract with alcoholic potash, and extracting the aqueous solution of the resulting soap with ether to remove cholesterol. The remaining liquid is used for the determination of fat acids. In the determination of casein the chief difficulty lies in its separation from the epithelium cells and foreign matter. This the author effects by extracting the feces in succession with ether, water, and alcohol, and then drying. The residue is digested with dilute hydrochloric acid (1 : $2\frac{1}{3}$) at 50°. This dissolves the casein and leaves the epithelium debris. The casein is calculated from the nitrogen determined by the Kjeldahl method. The results obtained are lower than those given by the old methods; but the author claims that they are nearer the truth.

Salt River Valley Soils. By Robert H. Forbes. *Ariz. Agr. Expt. Sta. Bull.*, **28**, 66–99. — This bulletin contains the results of analyses made of the alkaline soils of Arizona, taken entirely from the surface, and in nearly all cases at a dry season of the year. A discussion of the object and value of soil analyses is also included.

Carbon Dioxide from Fermentation. By Dr. P. Fischer. *Pharm. Rev.*, **16**, 214–220.—The author discusses the recovery of carbon dioxide from the fermentation of beer. 100 pounds of beer-wort will furnish about 4 pounds of carbon dioxide. Calculated on this basis the annual production in the United States, most of which, however, still escapes into the atmosphere, is more than 300,000,000 pounds. The process and plant used by the Pabst Brewing Company, of Milwaukee, is described. Here air-free gas is collected directly from the fermenting tubs, and is subsequently liquefied and purified. In 1897 this company sold over 1,500,000 pounds of the liquefied gas.

A Preliminary Report on the Soils of Florida. By Milton Whitney. *U. S. Dept. Agr., Div. of Soils, Bull.* **13**.—This report contains a brief description of the principal types of soil and the characteristic vegetation, and a discussion of the chemical composition, of the physical texture, and of the water content, with reference to the differences in agricultural value.

An Electrical Method of Determining the Moisture Content of Arable Soils. By Milton Whitney, Frank D. Gardner, and Lyman J. Briggs. *U. S. Dept. Agr., Div. Soils, Bull.* **6**. —The principles of physical chemistry involved in the method are discussed, and a description and illustrations of the apparatus are given.

An Electrical Method of Determining the Temperature of Soils. By MILTON WHITNEY AND LYMAN J. BRIGGS. *U. S. Dept. Agr., Div. Soils, Bull.* 7.

An Electrical Method of Determining the Soluble Salt Content of Soils. By MILTON WHITNEY AND THOS. H. MEANS. *U. S. Dept. Agr., Div. Soils, Bull.* 8.

Methods for the Examination of Milk. By BYRON STANTON. *Ohio San. Bull.*, 2, 17–25.—This paper is a critical discussion and comparison of the various methods in use for detecting adulteration in milk. It does not contain anything new.

A Comparison of Utah Feeding Stuffs. By LUTHER FOSTER and LEWIS A. MERRILL. *Utah Agr. Expt. Sta. Bull.*, 54, 119–140.

Digestion Experiments with Shredded Corn-fodder, Lucern, Timothy, and Wheat Bran. By JOHN A. WIDTSOE. *Utah Agr. Expt. Sta. Bull.*, 54, 141–151.

Cotton and Corn Experiments. By C. C. PITTUCK. *Tex. Agr. Expt. Sta. Bull.*, 45, 978-1008.

E. H. RICHARDS, REVIEWER.

Nutrition Investigations in Pittsburg. By ISABEL BEVIER. *U. S. Dept. Agr. Bull.*, 52, 1–48.—In the course of these studies a special point was made of the composition and cost of bread made at home in comparison with that purchased from bakeries. There is also a discussion of the apparent loss of nutrients during the process of baking.

Nutrition Investigations at the University of Tennessee in 1896 and 1897. By CHAS. E. WAIT. *U. S. Dept. Agr. Bull.*, 53, 1–46.—In addition to three dietaries this bulletin contains valuable data upon the composition of Tennessee beef, mutton, and chicken. There is also an account of twenty-one digestion experiments with men, from which it appears that, in the cases given, a diet of bread and beef yielded only 85.5 per cent. of the total energy in the food eaten; one of bread, milk, and eggs, 88.6; an average of 11 mixed diets, 89.9; while bread and milk alone returned 92.3 per cent. of the calculated energy. Although the time of the experiments—two days—was far too short for any very conclusive results, the facts have a certain value in the dearth of similar studies under American conditions.

Nutrition Investigations in New Mexico in 1897. By ARTHUR GOSS. *U. S. Dept. Agr. Bull.*, 54, 1–20.—In addition to a die-

tary of a poor Mexican family, the author gives the analyses of the different cuts of a side of New Mexico range beef, which show the remarkable absence of fat in this class of meat when killed in the spring.

A Method for the Differentiation of Organic Matter in Water. By A. G. WOODMAN. *J. Am. Chem. Soc.*, **20**, 497–501.—The reagent used is potassium bichromate and the method is a modification of that given by Joseph Barnes, which is essentially the determination of the ratio between the amount of oxygen used up by potassium permanganate and by bichromate from the same water. The results given indicate that the method is worth further trial.

The Operation of a Slow Sand Filter. By CHAS. E. FOWLER. *J. N. E. Water Works Assoc., 1898*, 209–244.

The Origin of Free and Albuminoid Ammonias in Polluted Waters. By ELMER G. HORTON. *J. Am. Public Health Assoc.*, **23**, 199–205.—The author discusses the decomposition of urea under the conditions obtaining in the distillation for ammonia.

The Public Water Supplies of the State. By A. W. SHAFTER. *N. C. Board of Health, Bull.* **13**, 2, 1–23.—The report includes a bacteriological and a partial chemical examination of the supply of 14 towns together with an examination of the watershed.

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REVIEW OF AMERICAN CHEMICAL RESEARCH.

VOL. IV. NO. 11.

ARTHUR A. NOYES, Editor; HENRY P. TALBOT, Associate Editor.
REVIEWERS: Analytical Chemistry, H. P. Talbot and W. H. Walker; Biological Chemistry, W. R. Whitney; Carbohydrates, G. W. Rolfe; General Chemistry, A. A. Noyes; Geological and Mineralogical Chemistry, W. O. Crosby; Inorganic Chemistry, Henry Fay; Metallurgical Chemistry and Assaying, H. O. Hofman; Organic Chemistry, J. F. Norris; Physical Chemistry, H. M. Goodwin; Sanitary Chemistry, E. H. Richards; Technical Chemistry, A. H. Gill and F. H. Thorp.

GENERAL AND PHYSICAL CHEMISTRY.

A. A. NOYES, REVIEWER.

The Atomic Weight of Cadmium. BY H. N. MORSE AND H. B. ARBUCKLE. *Am. Chem. J.*, **20**, 536–542.—In order to determine any correction that may exist for the presence of retained gas in the cadmium oxide, the authors have repeated the atomic weight determinations of Morse and Jones (*Am. Chem. J.*, **14**, 241) using essentially the same method and the same samples of cadmium. The gas evolved on dissolving the oxide was collected as in the authors' experiments with zinc oxide (*this Rev.*, 4, 55), and, as before, was found to be very appreciable in quantity, and to consist of oxygen and nitrogen. The uncorrected result, 112.084, is very close to that previously obtained, 112.071, while the corrected one, 112.377, now agrees well with those obtained by Bucher, 112.39 and 112.38, in his work on the chloride and bromide of cadmium.

A Table of Atomic Weights. BY THEODORE WILLIAM RICHARDS. *Am. Chem. J.*, **20**, 543–554.—The author has made a critical study of the reliability of the existing atomic weight determinations, and has compiled a new table of atomic weights. In the case of seven elements his values differ markedly from those of Clarke, as is shown below:

	Richards.	Clarke.
Antimony	120.0	120.43
Cadmium	112.3	111.95
Calcium	40.0	40.07
Magnesium	24.36	24.28
Platinum	195.2	194.89
Tungsten	184.4	184.83
Uranium	240.0	239.59

The Reliability of the Dissociation Values Determined by Electrical Conductivity Measurements. By Arthur A. Noyes. *J. Am. Chem. Soc.*, **20**, 517–528.—The author endeavors to show that an error has been made by van Laar (*Ztschr. phys. Chem.*, **21**, 79) in the derivation of his heat-of-solution formula, and that therefore his conclusion based thereon in regard to the unreliability of the dissociation values determined by electrical conductivity is entirely unjustifiable. The question is also discussed from several other points of view. Incidentally a new, rigidly exact and general expression is derived from the relation between the heat of solution of dissociated substances and the change in their solubility with the temperature.

Molecular Weights of Some Carbon Compounds; A Few Words More. By C. L. Speyers. *J. Am. Chem. Soc.*, **20**, 546–547.—This note is a reply to the criticism by the reviewer of a previous article by the same author (*this Rev.*, **4**, 55). In explanation of his presentation to his readers of several pages of numerical results without a word of discussion, the author states that he himself was at a loss to account for the peculiar results obtained. He rejects the suggestion of the reviewer as to the possibility of error from imperfect elasticity of the bulb.

The Atomic Mass and Derivatives of Selenium. By Victor Lenher. *J. Am. Chem. Soc.*, **20**, 555–579.—A current of hydrochloric acid gas was passed over silver selenite, first in the cold, then at a general heat; the silver chloride formed was weighed, and reduced with hydrogen; and the residual silver again weighed. Eleven determinations of the ratio $Ag_2SeO_3 : 2AgCl$ gave 79.329 as the atomic weight of selenium and eight determinations of the ratio $Ag_2SeO_3 : 2Ag$ gave an identical value. From ammonium bromoselenate the selenium was precipitated by hydroxylamine hydrochloride, the precipitate collected on a Gooch filter and weighed. Eight determinations of the ratio $(NH_4)_2SeBr_6 : Se$ lead to the atomic weight 79.285. In conclusion, a large number of organic and inorganic bromoselenates are described; and evidence of the non-existence of a selenium monoxide is furnished by several experiments.

Osmotic Pressure. By C. L. Speyers. *J. Am. Chem. Soc.*, **20**, 579–585.—The author attempts to show with the help of hypotheses relating to the constitution of solutions, that the specific gravity value which enters in the thermodynamical relation between osmotic pressure and vapor pressure is that of the pure solvent and not that of the solution. This conclusion had, however, already been reached by other authors. The author, to be sure, considers the mechanical arrangement in-

volved in the demonstration of it recently given by Noyes and Abbot to be "purely imaginary and not possible in fact," and "the results depending on their theoretical deductions to be valueless."

ANALYTICAL CHEMISTRY.

ULTIMATE ANALYSIS.

W. H. WALKER, REVIEWER.

On the Lindo-Gladding Method of Determining Potash. By A. L. WINTON AND H. J. WHEELER. *J. Am. Chem. Soc.*, **20**, 597–609.—With a view of meeting certain criticisms of the Lindo-Gladding method for determining potash, the authors have made an extensive study of the recent work bearing on the subject. Numerous data are presented which show that the objections made to the process are, so far as practical considerations go, without foundation.

On the Estimation of Manganese Separated as Carbonate. By MARTHA AUSTIN. *Am. J. Sci.*, **155**, 382–384.—The separation of manganous carbonate is shown to be both rapid and complete when made in a warm solution and in the presence of considerable ammonium chloride. The precipitate cannot, however, be weighed as carbonate, as carbon dioxide escapes before all the moisture has been expelled; but, by the addition of sulphuric acid and subsequent weighing as anhydrous sulphate (*this Rev.*, **4**, 60) an accurate determination can be made.

A New Volumetric Method for the Determination of Copper. By RICHARD K. MEADE. *J. Am. Chem. Soc.*, **20**, 610–613.—A volumetric method for the determination of copper more accurate and also more widely applicable than either the cyanide or iodine method is found to be the following: The copper is precipitated from an acid solution by addition of ammonium or potassium thiocyanate, and the cuprous salt thus obtained converted to cuprous oxide by warming with potassium hydrate. To this is added a solution of ferric chloride or sulphate, and the ferrous salt formed by the oxidation of the cuprous oxide is then titrated with standard permanganate solution.

A Short Study of Methods for the Estimation of Sulphur in Coal. By G. L. HEATH. *J. Am. Chem. Soc.*, **20**, 630–637.—The author makes a comparative study of the five more common methods for the determination of sulphur in coal, and notes such modifications and precautions as he finds necessary to obtaining the most accurate results.

On the Condition of Oxidation of Manganese Precipitated by the Chlorate Method. By F. A. Gooch and Martha Austin. *Am. J. Sci.*, **155**, 260–268.—Although the "chlorate process" is at present the method most widely used by practical chemists for the separation of manganese, yet the degree of oxidation of the precipitated oxide has never been definitely determined. The author finds the more soluble sodium chlorate a better precipitant than the potassium salt, but that the precipitate produced by neither of these corresponds exactly to the dioxide, MnO_2. A procedure is given by which the precipitate can be made to correspond to the formula, but it is not recommended by the authors as a rapid analytical method.

F. J. Moore, Reviewer.

Use of Hydrofluoric Acid in the Determination of Manganese in Iron and Ores. By Allen P. Ford and I. M. Bregowski. *J. Am. Chem. Soc.*, **20**, 504–506.—An objection to the Williams method is the clogging of the filter by separated silicon. This may be completely dissolved and the filtration accelerated by the addition of a few drops of hydrofluoric acid just after the precipitation of the manganese peroxide. In the analysis of ores by this method, the presence of hydrofluoric acid has the peculiar effect of making the precipitation more complete, thus rendering a second precipitation unnecessary.

The Determination of Lead in Alloys. By W. E. Garrigues. *J. Am. Chem. Soc.*, **20**, 508–510.—Lead may be separated from copper and zinc by precipitation as chromate in ammoniacal solution. The following separation of lead from tin is outlined: The alloy is decomposed by nitric acid, the metastannic acid is dissolved in concentrated sulphuric acid, and, after specified dilution, filtered off from the insoluble lead sulphate.

Inaccuracies in the Determination of Carbon and Hydrogen of Combustion. By Charles F. Mabery. *J. Am. Chem. Soc.*, **20**, 510–513.—The author enumerates four important sources of error: inefficiency of the purifying train; loss of gaseous hydrocarbons; imperfect absorption of carbon dioxide; and loss of moisture from the potash bulb. A statement of how the difficulties may be overcome is postponed till the completion of work now on hand.

Some Further Applications of Hydrogen Peroxide to Quantitative Analysis. By Percy H. Walker. *J. Am. Chem. Soc.*, **20**, 513–515.—Hydrogen peroxide prevents the precipitation of titanium by ammonia and of uranium by sodium hydroxide.

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This affords a means of separation of both metals from iron, and of uranium from zirconium.

The Error in Carbon Determinations Made with the Use of Weighed Potash Bulbs. By GEORGE AUCHY. *J. Am. Chem. Soc.*, **20**, 528–534.—In a series of combustions, sulphuric acid bulbs were used to determine the amount of moisture carried over from the prolong of the potash bulbs. Some anomalous results obtained were traced to the condensation of moisture upon the outside of the bulbs. It was found that the error from this source may, in moist weather, exceed that caused by neglecting to use the sulphuric acid bulbs at all. Furthermore, this error cannot be compensated for by the use of tared bulbs, as the condensation proceeds with utter irregularity under apparently similar conditions. This renders true blanks in damp weather impossible. The conclusions reached are supported by a large amount of experimental data.

Note on Drown's Method of Determining Silicon in Steel. By GEORGE AUCHY. *J. Am. Chem. Soc.*, **20**, 547–549.—The author modifies Drown's method by conducting the evaporation with aqua regia and sulphuric acid, instead of sulphuric and nitric acids. He claims a gain in accuracy as well as practical convenience.

Electrolytic Determination of Tin in Tin Ores. By E. D. CAMPBELL AND E. C. CHAMPION. *J. Am. Chem. Soc.*, **20**, 687–690.—Tin ores are decomposed by fusion with sodium carbonate and sulphur, the resulting sulphostannate transformed to the double oxalate of tin and ammonia, and the latter electrolyzed. The transformation to the double oxalate is accomplished as follows: The sulphostannate solution is neutralized with hydrochloric acid, and sodium peroxide is added. This oxidizes the tin to stannic chloride. The sulphur is now filtered out, and ammonia and ammonium oxalate are added to the solution. From the solution so obtained the tin is satisfactorily deposited by a current of 0.10 ampere and 4 volts.

HENRY FAY, REVIEWER.

Iodometric Estimation of Tellurium. By JAMES F. NORRIS AND HENRY FAY. *Am. Chem. J.*, **20**, 278–283.—In the presence of a large excess of alkali, tellurous acid is oxidized quantitatively by potassium permanganate to telluric acid according to the equation: (1) $2KMnO_4 + 3TeO_2 = K_2O + 2MnO_2 + 3TeO_3$. If to such a solution potassium iodide and sulphuric acid are added, the following reaction takes place: (2) $2MnO_2 + 4KI + 4H_2SO_4 = 2MnSO_4 + 2K_2SO_4 + 4H_2O + 4I$. Any excess of permanganate will react as follows: (3) $2KMnO_4 +$

$10KI + 8H_2SO_4 = 2MnSO_4 + 6K_2SO_4 + 8H_2O + 10I$. Combining equations (1) and (2) the oxidation of tellurium dioxide may be expressed in this way: $2KMnO_4 + 3TeO_2 + 4KI + 5H_2SO_4 = 3TeO_3 + 3K_2SO_4 + 2MnSO_4 + 5H_2O + 4I$. There is therefore found to be a deficit of two atoms of iodine, or two molecules of sodium thiosulphate for each molecule of tellurium dioxide present. In estimating tellurium by this method a portion of the substance, about 0.150 gram, is treated with 20 cc. of a ten per cent. solution of sodium hydroxide, potassium permanganate is added until the meniscus of the brown solution shows a deep pink. The solution is then diluted to 400 cc. with ice-water, and there are added 10 cc. of potassium iodide solution containing 2 grams of the salt, and dilute sulphuric acid until the solution becomes clear. The liberated iodine is titrated with sodium thiosulphate. The value of the permanganate solution is found in the same way by liberating iodine from potassium iodide and titrating with thiosulphate. The deficit in sodium thiosulphate represents the tellurium dioxide present. The method was tested against carefully purified tellurium dioxide made from recrystallized basic nitrate, and against the double bromide of tellurium and potassium. The process is rapid, gives accurate results, and can be used in the presence of halogen acids.

PROXIMATE ANALYSIS.

H. P. TALBOT, REVIEWER.

The Commercial Analysis of Bauxite. BY WM. B. PHILLIPS AND DAVID HANCOCK. *J. Am. Chem. Soc.*, **20**, 209–225.—In the interests of those concerned in the alum manufacture from bauxite, it is essential that a plan be devised by which the amount of easily soluble alumina may be determined, as well as the total amount. A scheme is presented by which it is possible to distinguish between the alumina present as trihydrate, that is in a state of lower hydration, and that as clay. It is suggested that the alumina soluble in sulphuric acid of 50° B. at 100° C. in one hour be called "free alumina", that soluble only when the solution is evaporated until the acid fumes appear "available alumina," while the difference would be designated as "combined alumina," this system to be adopted by producer, broker, and consumer alike.

A. H. GILL, REVIEWER.

A Comparison of Various Rapid Methods for Determining Carbon Dioxide and Monoxide. BY L. M. DENNIS. *J. Am. Chem. Soc.*, **19**, 859–870.—The results show the comparative accuracy of the various forms of apparatus in use and are summarized in the article.

The Econometer: a Gas Balance for Indicating Continuously the Proportion of Carbonic Acid Gas in the Flow of Furnace Gases. REPORT BY A COMMITTEE. *J. Franklin Inst.*, **145**, 205. —Instead of absorbing the carbon dioxide, this apparatus weighs the dried and filtered gas continuously. The weight being known, the percentage of carbon dioxide is easily deduced. There are said to be over twelve hundred of these apparatus in use.

MINERALOGICAL AND GEOLOGICAL CHEMISTRY.

W. O. CROSBY, REVIEWER.

Orthoclase as Gangue Mineral in a Fissure Vein. BY WALDEMAR LINDGREN. *Am. J. Sci.*, **155**, 418–420.—After noting the rather sparing occurrence of the feldspars in true veins, the author describes a silver-gold vein near Silver City, Idaho, having a gangue of quartz and orthoclase. The orthoclase is of the variety *adularia*, and the evidence of its aqueous origin is followed by an analysis yielding: SiO_2, 66.28; Al_2O_3, 17.93; K_2O, 15.12; Na_2O, 0.25; undetermined, 0.42; total, 100.00.

Notes on Rocks and Minerals from California. BY H. W. TURNER. *Am. J. Sci.*, **155**, 421–428.—This paper describes: 1. A peculiar quartz-amphibole diorite, with very complete analyses of the diorite and its component amphibole; 2. A new amphibole-pyroxene rock from Mariposa County; 3. A quartz-alunite, with an analysis of the alunite, which occurs as an efflorescence; 4. Zircon from gravels; 5. Molybdenite from several localities; 6. Tellurium, selenium, and nickel in gold ores; 7. Carbonaceous material in quartz from gold veins east of the Morter Lode; 8. Berthierite from Tuolumne County.

Mineralogical Notes on Anthophyllite, Enstatite, and Beryl (Emerald) from North Carolina. BY J. H. PRATT. *Am. J. Sci.*, **155**, 429–432.—The anthophyllite and enstatite are from the great dunite dikes of western North Carolina, and two analyses of each are given. The emerald is from a vein of pegmatite in Mitchell County, and was not analyzed.

The Jerome Kansas Meteorite. BY HENRY S. WASHINGTON. *Am. J. Sci.*, **155**, 447–454.—This meteorite, about 65 pounds in weight, is a deeply oxidized mass made up of numerous chondrules of bronzite and olivine, with fragmental crystals of these minerals and pyroxene, and small angular masses of nickel-iron (4.3 per cent.). No troilite was recognized, but the analysis indicates that it was originally present to the extent of 5.2 per cent. An approximate chemical analysis and an analysis of the

nickel-iron, which contains 10.01 per cent. of nickel, are followed by exhaustive analyses of both the soluble and insoluble portions; and from these analytic data the mineralogical composition is calculated, the chief constituents, in order of abundance, being olivine, bronzite, limonite (secondary), oligoclase, troilite, pyroxene, nickel-iron, and orthoclase.

On the Origin of the Corundum Associated with the Peridotites in North Carolina. By J. H. Pratt. *Am. J. Sci.*, **156**, 49–65.—The peridotite (dunite or olivine rock) is a basic, magnesian, plutonic rock forming lenticular dikes and bosses in gneiss, and the corundum is invariably found on the borders of these masses, between the dunite and gneiss. The author's conclusion, which appears to be well sustained by the facts, is that the corundum is not in any sense a secondary mineral, but dates from the original solidification of the dunite, having existed in the solution of the molten mass of the dunite at the time of its intrusion and separated out among the first minerals as the mass began to cool. The dunite magma holding in solution the chemical elements of the different minerals would be like a saturated liquid, and as it began to cool the minerals would crystallize out, not according to their infusibility but according to their solubility in the molten magma. The more basic portions, according to the general law of cooling and crystallizing magmas, being the most insoluble, would be the first to separate out. These would be the oxides containing no silica, such as chromite, spinel, and corundum. The important experiments of Morozewicz with molten basic glasses are cited as fully corroborating this view; and it is noted that the crystallization of the corundum and other oxides would begin on the outer border of the mass where cooling was most rapid. Convection currents would then tend to bring new supplies of material carrying alumina into this outer zone, where it would be deposited as corundum. This is essentially Becker's theory of fractional crystallization; and it is noted that the high fluidity of these very basic magmas is a very favorable condition.

Erionite, a New Zeolite. By Arthur S. Eakle. *Am. J. Sci.*, **156**, 66–68.—This mineral occurs in very fine, white, pearly and woolly threads, associated with opal in a rhyolite tuff from Durkee, Oregon. Analysis gives: SiO_2, 57.16; Al_2O_3, 16.08; CaO, 3.50; MgO, 0.66; K_2O, 3.51; Na_2O, 2.47; H_2O, 17.30; total, 100.68. Allowing one molecule of water as hydroxyl, as the dehydration experiments indicate, we obtain the formula $H_2Si_6Al_2CaK_2Na_2O_{17} + 5H_2O$. This is analogous to the formula for stilbite with the calcium largely replaced by alkalies; but in other respects the new zeolite has no resemblance to stilbite.

The name refers to its woolly appearance. An analysis of the associated milky opal gave: SiO_2, 95.56; H_2O, 4.14; and a trace of alumina.

Metamorphism of Rocks and Rock Flowage. By C. R. VAN HISE. *Am. J. Sci.*, **156**, 75–91; *Bull. Geol. Soc. Am.*, **9**, 269–328.—This important contribution to dynamical geology, which is condensed from a partly written treatise on metamorphism and the metamorphic rocks, is mainly a physical study; but the important cooperation of chemical agencies is fully recognized in the paragraphs on chemical action and its relations to heat and pressure, the upper and lower physico-chemical zones, etc. Van't Hoff's law, that "on the whole, the preponderating chemical reactions at lower temperatures are the combinings (associations) which take place with the development of heat, while the reactions preponderating at higher temperatures are the cleavings (dissociations) which take place with the absorption of heat, is made a basic principle of the discussion; and the contrasts of the upper and lower zones of the earth's crust resulting from this law and the natural antagonism of heat and pressure are traced out in hydration and dehydration, the mutual replacements of oxygen and sulphur, carbon dioxide and silicon dioxide, and the tendency to develop in the upper zone minerals of lower specific gravity with consequent expansion of the rocks, and in the deeper-seated zone of minerals of higher specific gravity with consequent contraction of the rocks. In both the physical and chemical categories, alike at lesser and greater depths, water is recognized as the one important and essential medium of alteration; and an almost inappreciable proportion of water is regarded as sufficient for extensive and rapid metamorphism, in which it may act solely as agent, suffering neither gain or loss. In this connection, the author cites the experiments of Barus, according to which 180° C. is a critical temperature for the solution of glass in water, the action being very slow below this temperature and astonishingly rapid above it. The solution of the glass and crystallization of its derived minerals are essentially contemporaneous and continuous processes, involving, in the absence of hydrous derivatives, no necessary diminution of the water, which may continue its work as a mineralizer indefinitely and so rapidly as to dissolve and deposit in crystalline form a volume of glass equal to that of the water in about half an hour from which the author calculates that, even if the rate for rocks be only one-thousandth that for glass, a rock formation could be dissolved and recrystallized 50,000 times by one per cent. of water in a mountain-making period of 150,000 years.

Mineralogical Notes. By C. H. Warren. *Am. J. Sci.*, **156**, 116–124.—This paper describes: 1. Melanotekite, a basic silicate of iron sesquioxide and lead, from Hillsboro, New Mexico, the analyses of exceptionally pure material indicating for this species and kentrolite, the corresponding basic silicate of manganese sesquioxide and lead, the formula $Fe_4(Mn_4)Pb_3Si_2O_{15}$, instead of $Fe_2(Mn_2)Pb_2Si_2O_9$, heretofore accepted. 2. Pseudomorphs after phenacite, from Greenwood, Maine, in which gigantic crystals up to twelve inches in diameter having the form of phenacite have been completely replaced by a mixture of quartz and cookeite, with not a trace of beryllium remaining. 3. Similar pseudomorphs after large crystals of topaz from the same locality. 4. Crystallized tapiolite (tantalate of iron and manganese) from Topsham, Maine, which is distinguished by its tetragonal form from its orthorhombic dimorph, tantalite, and by its composition from the corresponding dimorphous niobates, mossite and columbite. 5. Crystallized tantalite from Paris, Maine, which is shown by its very high specific gravity (7.26) not to be columbite, while the absence of manganese adds to its chemical interest. 6. Cobaltiferous smithsonite from Boleo, Lower California, which had been mistaken for the rare hydrated cobalt carbonate, remingtonite, but which is found by analysis to contain 39.02 per cent. of ZnO and only 10.25 per cent. of CoO.

Sölvsbergite and Tinguaite from Essex County, Mass. By Henry S. Washington. *Am. J. Sci.*, **156**, 176–187.—The sölvsbergite forms a dike four feet wide cutting granite, and is specially distinguished by the presence of glaucophane and riebeckite. One complete analysis is given and compared with four analyses from other regions; and from the analysis the mineral composition is computed, the chief constituents, in order of abundance, being albite, orthoclase, glaucophane, riebeckite, quartz, and titanite. In this connection an analysis is also given of the Quincy granite, in which T. G. White has reported a blue hornblende which he referred to glaucophane; analysis of four foreign granites are quoted for comparison; and the calculation of the mineral composition gives, in order of abundance, quartz, albite, orthoclase, riebeckite, and glaucophane, the riebeckite largely predominating over the glaucophane. The analyses are of special interest as pointing to the existence of a purely iron-alumina glaucophane. The tinguaite also occurs as a dike in the granite; and its most notable characteristic is the occurrence in it, apparently as an original constituent, of a large proportion (37.4 per cent.) of analcite. As before, the ana lysis is compared with the similar rocks of other regions and the mineral composition is deduced therefrom.

Distribution and Quantitative Occurrence of Vanadium and Molybdenum in Rocks of the United States. By W. F. Hillebrand. *Am. J. Sci.*, **156**, 209–216.—The analytical data show the quantitative occurrence and distribution of vanadium in a large number (57) and variety of igneous rocks, in a few of the component minerals of these rocks, and in a few metamorphic and secondary rocks. Two of the samples in the last series were highly composite, one representing 253 sandstones and the other 498 limestones. The conclusions suggested by a comparison of these data are: that vanadium occurs in quite appreciable amounts in the more basic igneous and metamorphic rocks, up to 0.08 per cent. or more of V_2O_3, but seems to be absent or nearly so from the highly siliceous ones; that the chief source of the vanadium is the heavy ferric-aluminous silicates—the biotites, pyroxenes, amphiboles; that limestones and sandstones contain only very small amounts of vanadium; that molybdenum is confined to the more siliceous rocks; and so far has been found only in traces in these.

An Occurrence of Dunite in Western Massachusetts. By G. C. Martin. *Am. J. Sci.*, **156**, 244–248.—The dunite or olivine rock, of which only two other occurrences are known in North America, forms an irregularly elliptical boss of distinctly igneous origin, about 1,000 by 2,000 feet in extent, in the town of Cheshire. The olivine is extensively serpentinized, and the original accessories include chromite, magnetite, and picotite. The olivine, purified by the Thoulet solution, gave on analysis: MgO, 51.41; SiO_2, 40.07; FeO, 4.84; Al_2O_3, 1.94; H_2O, 1.03; total, 99.29.

Anthracite Coal in Arizona.—By W. P. Blake. *Am. Geol.*, 21, 345–346.—This is a hard, graphitic anthracite forming heavy beds in the carboniferous strata of southern Arizona. It resembles the Rhode Island anthracite, but the percentage of ash is larger (13.20 to 30.00); it is hard to ignite, and its fuel value is practically *nil*. Five approximate analyses are given.

Studies on an Interesting Hornblende Occurring in a Hornblende Gabbro, from Pavone, near Ivrea, Piedmont, Italy. By Frank R. van Horn. *Am. Geol.*, **21**, 370–374.—The approximate mineralogical composition of the gabbro is: plagioclase 33, hornblende 27, diallage and hypersthene 25, and magnetite and spinel 15 per cent. The hornblende, although one of the most basic constituents of the rock, is only occasionally approximately idiomorphic in the prismatic zone. The author suggests that this crystallographic peculiarity may be due to the high percentage of alkalies which it contains. A complete analysis is

given and three others are quoted. The percentage of water is high (2.79), while the silica is very low (39.58). The discussion shows that the mineral is approximately an orthosilicate, and the author concludes that an orthosilicate molecule enters largely into the composition of the aluminous amphiboles.

Weathering of Diabase near Chatham, Virginia. By THOMAS L. WATSON. *Am. Geol.*, **22**, 85–101.—The rock in question is a typical olivine diabase (plagioclase, augite, olivine, and magnetite) and forms great dikes intersecting both the crystalline schists and gneisses and the Triassic shales and sandstones. It weathers in concentric layers, yielding bowlder-like residual masses; and the final product is a tough clay of a bright red color, while biotite, chlorite, and serpentine are intermediate derivatives. The analytic data include: 1. Bulk analyses of fresh, partially weathered, and completely decomposed diabase, the contrast of two and three being much more marked than of one and two, and the most essential changes being greatly increased hydration, partial loss of the alkalies (the soda, as usual, suffering more than the potash), almost complete loss of the alkaline earths (the magnesia yielding more readily and completely than the lime), great increase of iron oxide due both to loss of other constituents and peroxidation of FeO, and a notable diminution of the silica due to the elimination of the protoxide bases, the alumina alone remaining essentially unchanged. 2. Analyses of the augite and feldspar, as separated by the Thoulet solution, the feldspar proving to be a labradorite whose albite-anorthite ratio is Ab_5An_9. 3. Determination of the relative amounts of material in the fresh, altered and decomposed rock soluble in hydrochloric acid of different strengths, all other conditions remaining constant. The loss was greatest in the decomposed and least in the altered material, and was limited in the former almost wholly to the iron oxide and alumina, while in the latter and the fresh rock the lime and magnesia were also largely dissolved. 4. Analyses of the portions soluble in hydrochloric acid and sodium carbonate are compared with the bulk analyses to determine the percentage of each constituent lost and retained, the total loss on passing from the fresh to the decomposed rock amounting to 70.31 per cent., although previous investigations show that this loss rarely exceeds 50 per cent. of the total rock mass. 5. A mechanical analysis of the partially decomposed rock, showing the mineralogical character of the particles of different sizes.

Chemical and Mineral Relationships in Igneous Rocks. By JOSEPH P. IDDINGS. *J. Geol.*, **6**, 219–237.—This is an attempt to correlate the mineral composition of igneous rocks with the

chemical composition of their magmas; that is, of each rock as a whole. The chief difficulties are: first, the variable composition of the rock-making minerals, quartz alone having an absolutely fixed composition and no element occurring only in one mineral; second, the fact that no fixed association of minerals necessarily results from the crystallization of a magma, the result being largely controlled by the physical conditions. To avoid undue complexity, the author confines his attention to the more important rock-making minerals, including quartz, feldspathic minerals, micas, pyroxenes, amphiboles, olivine, and magnetite. The empirical and dualistic formulas are given for each species; and the latter are classified in accordance with the ratios of the protoxide and sesquioxide bases to the silica. After quoting briefly some of the laws governing the relations of the mineral and chemical composition formulated in an earlier paper, the author discusses in greater detail and with the aid of diagrams, the relations particularly of quartz, and of leucite, nephelite and sodalite; thus making more evident the interdependence of the various minerals on one another and on the chemical composition of the magma.

A Study of Some Examples of Rock Variation. By J. Morgan Clements. *J. Geol.*, **6**, 372–392.—The rocks in question include diorites, gabbros, norites, and peridotites occurring in the Crystal Falls iron-bearing district of Michigan. Petrographic descriptions and chemical analyses of the several types are followed by a discussion of their chemical relations, the complete analyses, percentages of the chief oxides, and atomic proportions of the metals, being presented in tabular form; and the author concludes that the rapid changes in mineralogical composition and texture in a single rock exposure, and the changes thus occasioned from one type into another through intermediate facies, show very clearly the intimate relationship of the rocks to one another, and warrants the assumption that they all belong to a geological unit.

Notes on Some Igneous, Metamorphic and Sedimentary Rocks of the Coast Ranges of California. By H. W. Turner. *J. Geol.*, **6**, 483–499.—The rocks considered in this paper include: 1. *Metabasalts and diabases*, formerly regarded as metamorphic sandstones, of which ten analyses are quoted without discussion. 2. *Serpentine*, which has also been regarded as, in part at least, altered sedimentary rocks, but which the author holds to be, in the main at least, of igneous origin. Nine analyses, representing five localities, are quoted, showing great uniformity of composition and indicating that olivine or rhombic pyroxene must have been a prominent constituent of all of the

original rocks from which the serpentines were derived. 3. *The Franciscian or Golden Gate formation.* 4. *The San Pablo formation*, which contains layers of rhyolitic tuff or pumice, of which two partial analyses are given.

Syenite-porphyry Dikes in the Northern Adirondacks. By H. P. Cushing. *Bull. Geol. Soc. Am.*, 9, 239–256.—These dikes, of which fourteen have been discovered, and which are shown by their field relations to be younger than the pre-Cambrian gneisses and anorthosites which constitute the mass of the Adirondacks and older than the Potsdam sandstone, consist of a sub-acid holocrystalline rock chiefly composed of acid feldspars (microperthite, albite, orthoclase, and microcline) and biotite, with less abundant quartz and hornblende, and accessory magnetite, hematite, apatite, and titanite, and various secondary species. Three original analyses are given, selected to represent the mean and extremes of composition; and from these the percentages of the component minerals are deduced. In the discussion of the petrologic relationships of the dikes, numerous other analyses of related rocks are quoted.

Weathering of Alnoite in Manheim, New York. By C. H. Smyth, Jr. *Bull. Geol. Soc. Am.*, 9, 257–268.—The alnoite, which forms several small dikes in the calciferous "sand rock" on East Canada Creek, is an ultrabasic type consisting largely of biotite, and serpentine derived from original olivine, the olivine itself being extremely rare, and the minor constituents are magnetite, apatite, and perofskite, with secondary calcite. The investigation is largely based upon the methods established by Merrill. Both the fresh rock and its highly weathered facies were analyzed, the chief points of interest being, as usual, the increase of ferric oxide and water and diminution of ferrous oxide, alkalies, alkaline earths and silica in the weathered material. From the analyses the loss for the whole rock and the percentages of each constituent retained and lost are calculated. The titanic oxide is shown to be one of the most resistant constituents of the rock, its behavior being almost identical with that of alumina, so that the two are taken together as the basis for comparison. The iron oxides have proved almost equally insoluble, the apparent net increase being due, of course, to peroxidation of FeO. The large proportions of magnesia and lime in the weathered rock indicate that the process is far from complete; and in harmony with this view 93.60 per cent. of the weathered rock was found to be soluble in hydrochloric acid and sodium hydrate solution. The contrast between the surface weathering and deep-seated alteration of rocks, the rate of decomposition of biotite, and the time of weathering, are also dis-

cussed. Biotite appears to weather rapidly in acid rocks and slowly in basic rocks simply because, while it is chemically one of the weakest constituents of the former, it is one of the most resistant constituents of the latter, the difference being relative only.

Clay Deposits and Clay Industry in North Carolina. By HEINRICH RIES. *N. C. Geol. Surv., Bull. 13*, 1–157.—Although regarded as a merely preliminary report, this is a fairly comprehensive, if not a detailed account, of the clays of a great state. But it is not of local interest only, for the admirable introductory sections, forming nearly half the work, and covering the chemical and physical properties, mining and preparation of clays in general, and more specifically of the kaolins or china clays, pottery clays, fire clays, and brick clays, must prove of general interest and value. Under the chemical properties of clays are discussed: the fluxing impurities, including the alkalies, compounds of iron, lime, and magnesia; non-fluxing impurities, including silica, titanium, organic matter, and water; analytical methods; and the rational analysis of clays. The descriptive sections include nearly seventy original analyses of North Carolina clays by Prof. Chas. Baskerville, of the State University; and these are repeated in tabular form at the end of the report. Each analysis gives the silica, alumina, ferric oxide, lime, magnesia, alkalies, moisture, and water; and in certain cases the ferrous oxide, organic matter, sulphuric and titanic oxide were also determined. By way of rational analyses, on which the value of a clay chiefly depends, the clay substance (pure kaolin), free sand, and total fluxes are given in each case; and for the china clays also the percentages of quartz and feldspar in the sand.

A. H. GILL, REVIEWER.

Preliminary Paper on the Composition of California Petroleum. By C. F. MABERY. *Am. Chem. J.*, **19**, 796–804.—Oil from Ventura and Fresno counties was examined. The former is extremely heavy and dark; it has a specific gravity of 0.888 at 20°, and contains 0.84 per cent. of sulphur. On distillation it gave 9.7 per cent. below 150°, 29.1 between 150° and 300°, and 61.2 residue above 300°. It was more carefully distilled *in vacuo*. Small quantities of benzene, toluene, probably also xylene, hepta- and octo-naphthenes were obtained. These will be treated more at length in a later article.—Fresno County oil is of lighter color and lower gravity and of a greenish hue. It contains but 0.21 per cent. of sulphur. On distillation it gave 33 per cent. below 150°, 25 per cent. from 150°–200°, 21 per cent.

between 200° and 250°, 12.4 per cent. from 250° to 300°, and but 9 per cent. above 300°. It is to be further investigated.

Notes upon the Chemical Composition of Natural Gas from Great Salt Lake. By F. C. Phillips. *Proc. Eng. Soc. Western Pa.*, **13**, 453.—An analysis by another observer has shown that the gas had apparently contained 16.6 per cent. of hydrogen, which would make it quite different from the gas in West Virginia. On passing the gas, however, for many hours through tubes containing pure and dry palladium chloride it was found that no hydrochloric acid was formed, which is proof that no hydrogen is contained in the gas.

[CONTRIBUTION FROM THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY.]

REVIEW OF AMERICAN CHEMICAL RESEARCH.

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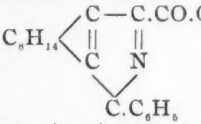
ORGANIC CHEMISTRY.

J. F. NORRIS, REVIEWER.

The Action of Ethylic Oxalate on Camphor (III). By J. BISHOP TINGLE. *Am. Chem. J.*, **20**, 318-342.— In previous papers (*J. Chem. Soc.*, **57**, 652, and *this Rev.*, **3**, 153) the preparation of camphoroxalic acid was described, and the formation by the acid of an additive compound with hydroxylamine was given as evidence that it is an unsaturated hydroxyl derivative of the formula $C_8H_{14}\begin{cases} C:C.OH.COOH \\ | \\ CO \end{cases}$. In order to gain additional evidence for the structure of the compound, the work described below was undertaken. By the action of acetic anhydride on camphoroxalic acid three substances were obtained: One was probably the anhydride of the acid, as it was also obtained when benzoyl chloride was used instead of acetic anhydride; the second compound was a monoacetyl derivative of camphoroxalic acid; the third compound was not identified. The acetyl derivative readily combines with bromine vapor, giving an oily product, which quickly loses hydrogen bromide. When camphoroxalic acid is treated with bromine in chloroform solution, the evolution of hydrogen bromide begins immediately. The resulting oil was reduced with magnesium amalgam. The substance thus obtained closely resembled camphoroxalic acid in general properties, but an examination of the crystals showed that it was not identical with it. The compound will be studied further in order to establish its structure. When quickly distilled under ordinary pressure, camphoroxalic acid yields some camphor. Heating with barium hydroxide in a current of dry

hydrogen causes almost complete conversion into camphor and oxalic acid. Attempts to convert camphoroxalic acid into an isomeric acid by prolonged heating at 150° were unsuccessful, whilst partial etherification with alcoholic hydrogen chloride failed to show any indication of non-homogeneity. When boiled with phenylhydrazine in anhydrous ether free from alcohol, the acid yields a crystalline salt. By the action of dilute sulphuric acid at 135° for three hours on camphoroxalic acid, a new acid of the formula $C_{12}H_{20}O_6$ was obtained. Ethyl camphoroxalate was obtained in pure condition by heating the acid with highly dilute absolute alcoholic hydrogen chloride. The ester readily combines with dry ammonia and with hydroxylamine. Attempts to obtain a benzoyl derivative of the ester were unsuccessful. Methyl camphoroxalate and phenyl hydrazine yield a phenylhydrazide, which is converted by glacial acetic acid into methyl camphylphenylpyrazolecarboxylate,

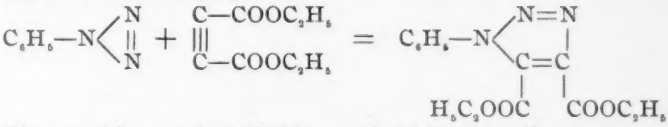


. Isoamyl camphoroxalate was also prepared and converted into a phenyl hydrazide. Camphylphenylpyrazolecarboxylic acid, when distilled over barium hydroxide, yielded an oily substance which gave Knorr's pyrazoline reaction. It probably contained camphylphenylpyrazole. Sodium camphylpyrazolecarboxylate injected into the veins of dogs is without any marked physiological action. Sodium camphoroxalate, under similar circumstances, is distinctly and rapidly toxic.

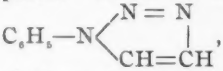
Veratrine and Some of Its Derivatives. By George B. Frankforter. *Am. Chem. J.*, **20**, 358–373.—The substance known in pharmacy as veratrine has been studied by a number of chemists, but concordant results have not been obtained, as different preparations of the alkaloid differ widely in composition and chemical, physical, and physiological properties. The author finds that crystallized veratrine is identical with the cevadine of Bossetti (*Arch. Pharm.*, *1883*, 82). The name veratrine, however, has been retained since cevadine is the common veratrum alkaloid used at present, and it seems advisable to retain the name which associates the alkaloid with the genus of plants from which it is obtained. The substance investigated was the so-called "Merck veratrine." The free alkaloid has the composition $C_{32}H_{49}NO_9.H_2O$ and was shown to contain a methoxy group. By triturating veratrine with a large excess of iodine, an iodide containing four atoms of iodine and three molecules of water of crystallization was obtained. When this salt

was heated at 110° to constant weight, an iodide containing two atoms of the halogen resulted. With ammonia the tetraiodide gave a monoiodide. Chloral hydrate reacted readily with the alkaloid forming a compound of the composition $CCl_3CH(O.C_{32}H_{48}NO_8)_2$. With methyl iodide an addition-product is formed. The iodine in this compound was removed by means of silver oxide and the resulting hydroxyl compound, $C_{32}H_{49}NO_9.CH_3OH$, converted into a hydrochloride, which formed a double salt with gold chloride. The alkaloid also formed crystalline addition-products with ethyl bromide and allyl iodide.

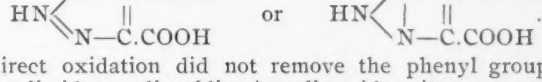
On the Formation of Imido-1,2-Diazol Derivatives from Aromatic Azimides and Esters of Acetylenecarboxylic Acids. By A. Michael, F. Luehn, and H. H. Higbee. *Am. Chem. J.*, **20**, 377–395.—Phenylazimide readily unites with the esters of $\Delta\alpha\beta$-acids of the acetylene series. The resulting addition-products do not show the instability that characterizes the trinitrogen ring, but are stable towards heat and towards most reagents. Phenylazimide and acetylenedicarboxylic ester reacted according to the following equation:



The resulting *n*-phenylimido-1,2-diazoldicarboxylic ester was converted into the free acid, and a number of its salts were prepared. When the acid was heated *n*-phenyl-1,2-imidodiazol,



, a weakly basic substance which formed a platinum double salt, was obtained. In order to establish the above formula for the diazoldicarboxylic acid, it was transformed into the triazolcarboxylic acid, which was prepared by Bladin (*Ber. d. chem. Ges.*, **26**, 545) and which has the formula



As direct oxidation did not remove the phenyl group from *n*-phenylimido-1,2-diazoldicarboxylic acid a nitro group was introduced and then reduced. The amino acid thus formed was readily oxidized to the above triazoldicarboxylic acid. The nitro derivative was prepared by condensing nitrophenylazimide with acetylenedicarboxylic ester, because a small yield of it was obtained when the diazoldicarboxylic acid was nitrated. *p*-Nitro-*n*-phenyl-1,2-imidodiazol was obtained by heating the corre-

sponding dicarboxylic acid. Phenylazimide condenses with phenylpropiolic ester and forms *n*-phenylimidophenyl-1,2-diazolcarboxylic acid. The compounds mentioned and a number of their derivatives are described in detail. The conclusion can be drawn from the authors' work that the addition of substituted azimides to esters of the acetylene carboxylic acids to form imidodiazol derivatives is a general reaction, since the fatty monobasic acetylene acids add negative atoms more readily than phenyl propiolic acid.

On the Oxide of Dichlormethoxyquinonedibenzoylmethylacetal. By C. Loring Jackson and H. A. Torrey. *Am. Chem. J.*, **20**, 395–430.—The substance prepared by Jackson and Grindley (*Am. Chem. J.*, **17**, 644) by the action of sulphuric acid on dichlordimethoxyquinonedibenzoyldimethylacetal has been found to be the oxide of dichlormethoxyquinonedibenzoylmethylacetal. It is the first example of an orthoquinone and has the following structure: $C_6.OCOC_6H_5(1),Cl(2),OCH_3(3),-OCOC_6H_5(4),OCH_3(4),Cl(5),O(6,1)$. The fact that the compound is not a ketone was shown by the failure of hydroxylamine to react with it, and by the formation of the sodium salt of chloranilic acid with a hot solution of sodium hydroxide. The substance does not contain a hydroxyl group since it is inactive with cold sodium hydroxide. Isoamylamine converts the oxide into the isoamylamine salt of oxydichlorisoamylamidoquinone, and sodium methylate changes the oxide into the sodium salt of dichlordimethoxyquinonedimethylhemiacetal. It is shown that these facts are evidence against the oxide being a paraquinone. The above reaction can be explained, however, if the substance is either an ortho- or a metaquinone, but the analogy between the reactions of ethylene oxide and those of the compound under discussion are so striking, that it is probable that the ortho structure exists in the oxide. Since a decision between the ortho and meta formulæ could not be founded on any study of the derivatives of the oxide, as both bodies give the same products when the oxygen bond was opened, the action of boiling sulphuric acid on pyrocatechin and resorcin, substances containing two hydroxyl groups in the ortho and meta positions, respectively, was studied. Resorcin gave resorcin ether and pyrocatechin gave colored products which were probably formed from a quinone. These experiments, therefore, did not furnish evidence for either structure. The compound formed by the action of isoamylamine on the oxide was shown to be the salt of the amine and a phenol of the composition $C_6Cl_2(C_5H_{11}NH)HOO_2$. For the sake of comparison with this body, dichlordiisoamylamidoquinone was made by the action of isoamylamine on chloranil. This compound, as

well as the isoamylamine salt of chloranilic acid, differed entirely in properties from the product made from the oxide. Tetrabromguaiacol and tribromveratrol, which were made in connection with the work on the action of sulphuric acid on pyrocatechin derivatives, are described. The following acetyl acetals were prepared: $C_6Cl_2(OCH_3)_2(OCH_3)_2(OCOCH_3)_2$ and $C_6Cl_2(OC_2H_5)_2(OC_2H_5)_2(OCOCH_3)_2$. Some experiments on the action of sodium alcoholates on quinone and chloranil, which led to the formation of very unstable colored compounds, are described. It is shown that an alkaline solution of sodium chloranilate is converted into iodoform by treatment with iodine.

On the Colored Compounds Obtained from Sodic Alcoholates and Picryl Chloride. By C. Loring Jackson and W. F. Boos. *Am. Chem. J.*, **20**, 444–454.—The authors have continued the work of Jackson and Ittner (*this Rev.*, 3, 107) on the colored products of the action of sodium alcoholates on certain aromatic nitro compounds. The substances formed from picryl chloride and the sodium derivatives of methyl, ethyl, propyl, isoamyl, and benzyl alcohol have been studied. They all have the formula $C_6H_2(NO_2)_3ORNaOR$, and are decomposed by acids giving picric ethers. According to the theory of Victor Meyer, these compounds are formed by the replacement of a hydrogen atom in the benzene ring by sodium, and the addition of a molecule of alcohol of crystallization. The fact, established by the authors, that the methyl compound can be heated to 130° without loss of weight, is evidence against the above theory. The more probable view is that the compounds are formed by the addition of the alcoholate to the picryl ether. Whether the alcoholate is added to the carbon of the benzene ring, or to a nitro group, is still an open question. By the decomposition of the corresponding colored compound with an acid, propyl, isoamyl, and benzyl ethers of picric acid were prepared. When a concentrated solution of picryl chloride in methyl alcohol was treated with an excess of an aqueous solution of barium hydroxide, a compound of the following formula was precipitated: $[C_6H_2(NO_2)_3OCH_3]_2Ba(OH)_2.10H_2O$.

On the Action of Orthodiazobenzenesulphonic Acid on Methyl and Ethyl Alcohol. By E. C. Franklin. *Am. Chem. J.*, **20**, 455–466.—A detailed description of the preparation of *o*- and *m*-amidobenzenesulphonic acids from benzene is given, together with an account of the separation and purification of the acids. *o*-Diazobenzenesulphonic acid was decomposed with methyl alcohol at atmospheric pressure, at an increase of 850 mm., and at a decrease of 450 mm. of mercury: The methoxy product alone was obtained. With ethyl alcohol only the alkoxy reac-

tion took place, although the yield was less than when methyl alcohol was used. Increased pressure favors the reaction. When *p*-methoxy or *p*-ethoxybenzenesulphonamide was treated with fuming nitric acid, *m*-dinitrobenzene and a nitro substitution-product of the corresponding sulphonic acid were formed. *o*-Methoxybenzenesulphonamide and fuming nitric acid gave, as one of the reaction-products, *m*-dinitrobenzene. With the meta compound, however, no dinitrobenzene was formed.

The Action of Nitric Acid on Tribromacetanilide. By William B. Bentley. *Am. Chem. J.*, **20**, 472–481.—On account of the conflict between the description of the nitro derivative of *s*-tribromaniline published by Körner (*Jsb. d. Chem.*, *1875*, 347) and that given by Remmers (*Ber. d. chem. Ges.*, **17**, 266) the author undertook a study of the compound. According to Remmers, tribromnitraniline can be prepared by saponifying with ammonia the nitro compound formed by the action of nitric acid on tribromacetanilide. The author was unable to obtain a nitro derivative from tribromacetanilide. Fuming nitric acid either had no action or produced an oily mass, from which nothing crystalline could be obtained. With concentrated acid (sp. gr. 1.38) several products were formed—tetrabrombenzene, a volatile oil of irritating odor (probably dibromdinitromethane), bromanil, oxalic acid, and picric acid. If the nitric acid was dilute, or was used in glacial acetic acid solution, the products were the same as when concentrated acid was used. In attempting to establish the identity of the bromanil formed in the reaction, the action of sodium phenylate on it was studied. In absolute alcohol solution dibromdiethoxyquinone was formed, but if 95 per cent. alcohol was used dibromdiphenoxyquinone was obtained as described by Jackson and Grindley (*this Rev.*, **1**, 427).

Researches on the Cycloamidines: Pyrimidine Derivatives. By H. L. Wheeler. *Am. Chem. J.*, **20**, 481–490.—For convenience of reference the author calls cycloamidines those compounds which have the amidine formation $RC\begin{matrix}=NR^{II}\\ -NXR^{I}\end{matrix}$ in which two of the radicals R, R^{I}, and R^{II} are replaced by a ring structure or a bivalent grouping. There are two types of cycloamidines, each type having a tautomeric form. The first contains one nitrogen atom in the ring; the second contains two. The object of the work, of which the present paper gives a preliminary account, was to compare the action of alkyl halides on cycloamidines and on simple amidines, in order to get further evidence of the correct structure of these compounds. Accord-

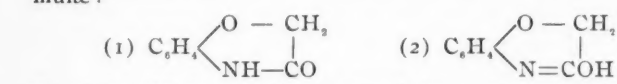
ing to Peckmann (*Ber. d. chem. Ges.*, **28**, 2362 and 869) when a simple amidine reacts with alkyl iodides, the hydrogen X is directly replaced, and hence the reaction serves to determine the structure of the compound. It is the author's opinion, however, that the above reaction is not conclusive evidence, for the alkyl iodides may be added either to the amido or imido group, or, when the substituents are similar, to both, and also perhaps to the atoms joined by the double bond. As a confirmation of the above opinion the author finds that phenylmethylanilidopyrimidine acts with methyl and ethyl iodides forming stable addition-products, and that no substitution takes place. As these compounds yield alcohols, sodium iodide, and unaltered anilidopyrimidine quantitatively when treated with alkali, the alkyl iodide in all probability was joined to one of the tertiary nitrogen atoms. From analogy a similar structure might be expected in the case of the alkyl halogen addition-products of the simple amidines. If this is the case the structure of the latter compounds must be completely revised, and the tautomeric structure must be assigned to them. Phenylmethylpyrimidon, a cycloamidine of the second type, unites with one molecule of methyl iodide to form a compound, which is decomposed into hydrogen iodide and an alkylated pyrimidon when treated with alkali. The alkyl derivative differs from the product obtained by heating phenylmethylchlorpyrimidine with sodium methylate. The alkyl iodide, therefore, is added to one of the nitrogen atoms of the pyrimidon ring.

On Phenylglutaric Acid and Its Derivatives. By A. S. Avery and Rosa Bouton. *Am. Chem. J.*, **20**, 509–515.—By the condensation of benzalmalonic ester with sodium malonic ester an oil was formed which could not be purified, but which consisted principally of benzaldimalonic ester, as it yielded β-phenylglutaric acid when saponified with hydrobromic acid. The silver, copper, and barium salts and the anhydride of the acid were analyzed. From the anhydride β-phenylglutaranilic acid, β-phenylglutaranil, and β-phenylglutar-p-tolilic acid were prepared. By the action of fuming sulphuric acid on the anhydride an acid containing no sulphur was obtained. Its nature was not established.

On α-Methyl-β-phenylglutaric Acid. By A. S. Avery and Mary L. Fossler. *Am. Chem. J.*, **20**, 516–518.—α-Methyl-β-phenylglutaric acid was prepared by the following method: The methyl ester of α-methylcinnamic acid was condensed with sodium malonic ester. When acidified the condensation-product yielded methylphenylpropanetricarboxylic ester, and, on saponification with potassium hydroxide, the corresponding acid. The

impure acid, when distilled over a free flame, gave the anhydride of α-methyl-β-phenylglutaric acid. The latter was dissolved in ammonia, treated with copper sulphate, and the free acid obtained by decomposing the copper salt with hydrogen sulphide. The silver salt was analyzed. As the acid contains two asymmetric carbon atoms the authors propose to study it further.

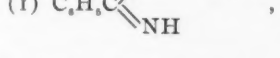
Researches on the Cyclo Amides: α-Ketobenzmorpholine and α-Benzparaoxazine Derivatives. By H. L. Wheeler and Bayard Barnes. *Am. Chem. J.*, **20**, 555–568.—α-Ketobenzmorpholine has the structure of a cyclo amide and yields isomeric compounds derived from the following tautomeric formulæ:



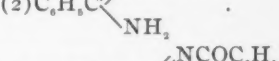
From the sodium and silver salt of the cyclo amide and alkyl iodides, derivatives of formula (1) and formula (2) (oxybenzparaoxazine), respectively, were obtained. The structures of the alkyl substitution-products were determined by the following facts: The product obtained by the action of methyl iodide on the sodium salt gave on prolonged heating with concentrated hydrochloric acid, at a high temperature, *o*-methylaminophenol, thus showing in the case of the sodium salts that the alkyl groups attach themselves to nitrogen. The products obtained from the silver salts immediately regenerated α-ketobenzmorpholine with cold dilute hydrochloric acid. This instability in the presence of acids, being a characteristic property of substituted imido esters, shows that in this case the alkyl groups are attached to oxygen. This analogy between the salts of α-ketobenzmorpholine and the salts of the anilides was shown further by the physical and chemical properties of the compounds. The cycloimido esters obtained from the silver salt have marked odors and decompose into ketobenzmorpholine on exposure to the air; the isomeric compounds have no odor and are stable on exposure. The compounds from the silver salt react with bases giving amidines, which yield well-crystallized salts. The silver salt of the cycloamide reacts with acyl chlorides, like the silver salts of the anilides, giving characteristic derivatives which have the acyl group joined to nitrogen. It follows that α-ketobenzmorpholine behaves like formanilide, and, therefore, has the structure represented by formula (1). The authors are of the opinion that amides have the keto formula because their oxy compounds do not lose water and form lactones. If the amides had the enol structure they would be imido acids and their oxy

derivatives would be expected to separate water like the oxy acids. The following substances are described: The sodium, methyl, and ethyl derivatives of α-ketobenzmorpholine; the silver, methyl, ethyl, isopropyl, isobutyl, and isoamyl derivatives of oxybenzparaoxazine; the acetyl, benzoyl, phenylamino, *m*-chlorphenylamino, β-naphthylamino, isobutylamino, and allylamino derivatives of benzparaoxazine; and a number of the salts of the amino derivatives.

The Action of Amines on Acylimidoesters: Acyl Amidines. By H. L. Wheeler and P. T. Walden. *Am. Chem. J.*, **20**, 568–576.—On account of the ease with which benzoylbenzamidine separates ammonia, giving dibenzamide, Pinner (*Die Imidoäther und ihre Derivate*) assigns to the compound the structure represented by formula (1):



(1) $C_6H_5C(NHCOC_6H_5)=NH$,



(2) $C_6H_5C(=NCOC_6H_5)NH_2$.

The authors find that benzoylbenzimido esters, $C_6H_5C(=NCOC_6H_5)OR$, react with ammonia, giving a compound which was shown to be identical with that obtained by Pinner, while an isomeric compound, formula (2), would be expected if the reaction takes place, as is usually assumed, by double decomposition, replacement, or substitution. It is probable that the action of amines on acylimidoesters, like the action of amines on the amidines themselves, does not take place by direct replacement, but involves the intermediate formation of an unstable addition-product, which in breaking down could form a compound of a type represented by either of the above formulas. That this view is correct and that this decomposition has no significance in regard to the structure of the acyl amidines is shown by the behavior of the analogously constituted acylimido esters, benzoylbenzimidoethyl ester, and benzoylphenylacetimidoethyl ester. These compounds easily decompose with water: The first gives dibenzamide and alcohol, and the second benzamide and ethylphenyl acetate. The structure of amidines cannot, therefore, be determined by their decomposition-products. A number of acyl amidines are described. They are stable towards cold alkali. Some of them dissolve in acids and can be precipitated unchanged by alkali or ammonia. They combine with one equivalent of hydrogen chloride to form unstable salts. In aqueous solutions these salts decompose, forming a diacylamide.

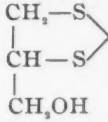
Preparation of Sodium Benzenesulphonate. By H. W. Hochstetter. *J. Am. Chem. Soc.*, **20**, 549.—If, in the prep-

aration of sodium benzenesulphonate by the method of Gattermann (*Die Praxis des organischen Chemikers*) the sulphonic acid is added to a sodium chloride solution having a specific gravity of 1.151 at 18°, the resulting salt is obtained in an almost pure condition. When a saturated salt solution is used the sulphonate is contaminated with about thirty-seven per cent. of sodium chloride.

The Action of Organic Acids upon Nitrils. By JOHN ALEXANDER MATHEWS. *J. Am. Chem. Soc.*, **20**, 648–668.—The author summarizes his work briefly as follows: (1) Cyanacetic acid under certain conditions appears to rearrange to yield its isomer malonimide. (2) Benzoic acid and ethylene cyanide give benzonitrile and succinimide. (3) Phenylacetic acid and ethylene cyanide give phenylacetonitrile and succinimide. As a secondary product phenylacetic acid and phenylacetonitrile give diphenyldiacetamide. (4) In (2) and (3) it seems probable that β-cyanpropionic acid is an intermediate product and rearranges to give succinimide, and that in general, when an imide is produced by this reaction, it may be considered as resulting from an intermediate cyan acid. (5) The substituted monobasic acids, salicylic and anthranilic, give no similar results on account of the decomposition they undergo by heating. (6) Phthalimide results from phthalic acid and propionitrile, and phthalimide and succinimide result from phthalic acid and ethylene cyanide. (7) Phthalic anhydride and acetonitrile do not react under the conditions presented. (8) Terephthalic acid and propionitrile do not react under the conditions presented. (9) Homophthalimide is not readily formed from homophthalic acid and a nitrile. It does not result by a rearrangement of cyan-*o*-toluic acid. (10) Diphenimide results in nearly theoretical amounts from diphenic acid and acetonitrile. (11) *o*-Sulphobenzoic acid and acetonitrile yield a compound isomeric with saccharin which may be unsymmetrical *o*-sulphobenzimide. (12) By varying the conditions three of the four possible imides of mellitic acid were produced by heating this acid with acetonitrile. The *p*-euchronic acid is a new compound; *o*-euchronic acid and paramid were already known. It has been shown that aluminum amalgam can be used to give the euchron test.

The Action of Metallic Thiocyanates upon Aliphatic Chlorhydrins. By WILBER DWIGHT ENGLE. *J. Am. Chem. Soc.*, **20**, 668–678.—The author's results may be briefly summarized as follows: Monochlorhydrin, α,γ-dichlorhydrin, and acetodichlorhydrin form corresponding thiocyanates, which are very unstable and immediately change to complex secondary compounds. α,β-dibromhydrin and its acetic ester form dithiocya-

nates, which can be separated and purified. Treated with tin and hydrochloric acid they give double chlorides of tin and a compound of the probable structure



Epichlorhydrin readily forms epithiocyanhydrin, which gives epihydrin sulphide with hydrogen sulphide, and epihydrindimethylsulphine iodide with ethyl iodide.

Acetonechloroform. By Frank K. Cameron and H. A. Holly. *J. phys. Chem.*, **2**, 322–335.—From the products of the reaction between acetone and chloroform in the presence of potassium hydroxide Willgerodt (*Ber. d. chem. Ges.*, **14**, 2456) isolated two substances which had the same composition and chemical properties. These were called solid and liquid acetonechloroform and were assigned the following formulæ respectively: $(CH_3)_2C.CCl_3.OH$ and $(CH_3)_2C.CCl_2H.OCl$. The authors have studied these compounds and have come to the conclusion that the liquid variety consists of the solid contaminated by a small amount of acetone and water. When the pure solid compound was moistened and distilled, an oil was formed which had all the properties of the liquid described by Willgerodt. Molecular weight determinations of the pure solid made by the freezing-point and boiling-point methods, using benzene and acetone as solvents, gave results agreeing with a simple molecular formula. From a study of the changes produced in the freezing-point of acetonechloroform by the addition of varying quantities of water, the conclusion is drawn that the hydrate previously described does not exist. Since the added water cannot be removed mechanically the mixture is perhaps a case of a solid solution.

The Menthol Group. By Edward Kremers. *Pharm. Arch.*, **1**, 107–121.—A critical review of the methods of preparation and properties of menthene and its nitrosochloride is given. Molecular weight determinations of the nitrosochloride were made, using ether, benzene, and chloroform as solvents. The results varied from 278 to 982, and were found to be dependent on concentration and temperature. Menthene nitrosate was shown to have twice the molecular weight represented by its formula.

Decomposition of Iodoform by Light. By Edward Kremers and E. C. W. Koske. *Pharm. Arch.*, **1**, 194–200.—According

to Fleury (*J. de Pharm. et de Chem.* [6], **6**, 97), when light acts upon a solution of iodoform, iodine is set free until the brown color in the solution prevents further decomposition. In one experiment when silver was added to unite with the liberated iodine the decomposition was complete. The authors show that iodoform is decomposed slowly by light which has passed through a solution of iodine in potassium iodide, and that nearly all of the iodine in iodoform is removed by silver in the dark after standing seven days.

ANALYTICAL CHEMISTRY.

PROXIMATE ANALYSIS.

A. H. GILL, REVIEWER.

On the Occurrence of Hydrogen Sulphide in the Natural Gas of Point Abino, Canada; and a Method for the Determination of Sulphur in Gas Mixtures. BY F. C. PHILLIPS. *J. Am. Chem. Soc.*, **20**, 696–705.—The gas mentioned in the title contained about 0.8 per cent. by volume of sulphuretted hydrogen. To determine sulphur in gas mixtures the gas is burned with oxygen from a burner resembling a Bunsen blowpipe, surrounded by a cylinder arranged so that the products of combustion can be collected in sodium hypobromite solution, the sulphur being finally estimated as sulphate. Where small samples of gas are collected these are displaced by the use of carbonic oxide. The results obtained by the precipitation of lead sulphide agreed very well with those obtained by combustion.

The Chemical Composition and Technical Analysis of Water Gas. BY E. H. EARNSHAW. *Am. Gas. Light J.*, **69**, 488–490; 528–529.—Benzene is absorbed by alcohol saturated with gas over mercury, the alcohol vapor being afterwards absorbed by water; carbon dioxide, by potassium hydrate; illuminants, by a saturated solution of bromine water; oxygen, by phosphorus; and carbonic oxide, by cuprous chloride, using finally a fresh pipette. The determination of hydrogen and the remaining hydrocarbons is effected by exploding a part of the residue over mercury, and by burning another part with air by passing over palladium black, the object of this being to determine the amount of CO left unabsorbed by the cuprous chloride, amounting sometimes to 0.4 per cent. The method of calculation of the results of explosion giving the average composition of the illuminants and the higher marsh gas hydrocarbons, as well as the calculation of the heating value, are also detailed.

The Determination of Methane, Carbon Monoxide, and Hydrogen by Explosion in Technical Gas Analysis. By W. A. Noyes and J. W. Shepherd. *J. Am. Chem. Soc.*, **20**, 343.—The apparatus used was that of Orsat, a fourth pipette being added for explosions; water acidulated with sulphuric acid was used as the confining liquid, it lessening the absorption of carbon dioxide. The results obtained are fairly satisfactory for technical work, those for methane varying from 0.5 per cent. too high to 0.2 too low, for carbonic oxide from 1.9 to 0.3 too low, for hydrogen from 0.3 too high to 0.5 too low.

The Gas Composimeter. *Elec. Eng.*, **25**, 311.—The article which is illustrated describes an instrument for determining and recording the per cent. of carbon dioxide in chimney gases. It depends for its action upon the flow of gases through small apertures. Gas is sucked constantly out of the chimney, passed through potassium hydrate solution, and the difference in the rate of flow of the residue and of the original gas is noted.

A. G. Woodman, Reviewer.

Standards for White and Black Mustard Seed. By John Uri Lloyd. *Pharm. Rev.*, **16**, 328–333.—This work was undertaken with a view to establish a standard for starch in powdered black and white mustard seed. The author finds for black mustard seed that the presence of even 0.1 per cent. of starch is shown by iodine in the presence of potassium iodide. He recommends that this test be employed after the sample has been mixed with a definite quantity of seed previously ascertained to be free from starch. For white mustard seed it was found that by the above test as little as 0.05 per cent. of starch can be detected with certainty.

Report on an Investigation of Analytical Methods for Distinguishing between the Nitrogen of Proteids and that of the Simpler Amides or Amido Acids. By J. W. Mallet. *U. S. Dept. Agr., Div. Chem., Bull.* **54**, 1–25.—This report embodies the results of an investigation undertaken by the author at the suggestion of the Office of Experiment Stations. A study was made of a number of typical substances representing proteids, gelatinoids, and the simpler amides and allied substances. An attempt to separate the water-soluble proteids from the amides by Graham's method of dialysis gave fairly clean separations of leucin, aspartic acid, and kreatin from solutions containing albumen, but the process was found inconveniently slow. The reaction with nitrous acid and evolution of elementary nitrogen gave results which varied greatly and no differences were found upon which an analytical procedure could be based. Experi-

ments on the interaction with sodium hypobromite, and with potassium permanganate in the presence of free acid or alkali, also gave no indication of distinctions sufficient for use in analysis. The only reagent that was found to give satisfactory results was a solution of phosphoduodeci-tungstic acid in dilute hydrochloric acid. By the use of this reagent as a precipitant, followed by thorough washing of the precipitate with hot water, it was found possible to effect a separation of the simpler amidic substances from all the proteids and proteid-like bodies except the peptones. This last group can be precipitated, however, by tannic acid. Full details of the proposed method are given. In order to calculate from the nitrogen found in each group after separation the amount of the proximate nitrogenous constituent present, the following factors are suggested: for proteids and allied substances, 6.25; for flesh bases and simpler amids of animal origin, 3.05; for simpler amids and amido acids of vegetable origin, 5.15; and for mixed amidic constituents of unabsorbed residua in digestion experiments, 9.45.

Separation of Proteid Bodies from the Flesh Bases by Means of Chlorin and Bromin. By H. W. Wiley. *U. S. Dept. Agr., Div. Chem., Bull.* **54**, 27–30.—This article is a description of the method of separation proposed by Rideal and Stewart and used in the laboratory of the Agricultural Department. After the finely ground material has been extracted with ether to remove fat, it is thoroughly exhausted with cold or lukewarm water, and then with water nearly boiling. The water-soluble constituents of the nitrogenous constituents, which have been thus extracted, are then precipitated by agitation with bromine water. The sum of the nitrogen in the part insoluble in water and in the part precipitated by bromine is subtracted from the total nitrogen determined in the original sample, and the difference is the nitrogen in the flesh bases. The proteids are calculated by the factor $N \times 6.25$, and the flesh bases by the factor $N \times 3.12$.

Commercial Fertilizers. *Md. Agr. Coll. Quart.*, 1, 1–41; *Ky. Agr. Expt. Sta. Bull.*, **76**, 97–105.

ASSAYING.

H. O. Hofman, Reviewer.

The Taylor Improved Assay Furnace. By R. P. Rothwell. *Eng. Min. J.*, **65**, 583.—This is a portable sheet-iron muffle-furnace weighing 250 pounds. It is 12 inches square, is lined with 2-inch fire-brick, takes a 6x12x4-inch muffle, and can be used as a melting furnace for a No. 16 graphite crucible after removing the muffle.

An Improved Method for Preparing Proof Gold and Silver. By J. W. PACK. *Eng. Min. J.*, 66, 36.—The improvement on the ordinary methods consists in precipitating gold and silver on aluminum foil. From a dilute solution of auric chloride, poured into a beaker containing aluminum foil, the gold is at once precipitated quantitatively; argentic chloride is completely decomposed by aluminum. Any residual aluminum is removed by warming the precipitated silver with hydrochloric acid.

APPARATUS.

A. H. GILL, REVIEWER.

A Convenient Gas Generator and Device for Dissolving Solids. By T. W. RICHARDS. *Am. Chem. J.*, 20, 189–195.—Six different forms of apparatus are figured and explained. They are simply constructed, give a constant evolution of gas, and the acid employed is completely used up; furthermore, the waste acid can be withdrawn without interrupting the action of the generator.

An Efficient Gas Pressure Regulator. By PAUL MURRILL. *J. Am. Chem. Soc.*, 20, 801.—The apparatus is of the usual floating bell type, and would seem to be very efficient and cheap.

Electric Furnaces for the 110-Volt Circuit. By N. M. HOPKINS. *J. Am. Chem. Soc.*, 20, 769–773.

Volumetric Apparatus. By G. E. BARTON. *J. Am. Chem. Soc.*, 20, 731–739.—The article compares the capacities of liter flasks standardized at various temperatures and advocates 22° C. as a standard as being more nearly that of the laboratory. The error of graduation of ten liter flasks from domestic and foreign makers was found to vary from zero to three hundredths of one per cent; the probable error in checking the calibration of a liter flask was ascertained to be not more than six-thousandths of one per cent. It was determined further that a difference in temperature of 0.1°, or a change of 15 mm. in the barometer, produced a variation of 0.02 cc.

Lubricants for Glass Stop-cocks. By F. C. PHILLIPS. *J. Am. Chem. Soc.*, 20, 678–681.—Two mixtures, one of 70 parts pure rubber, 25 parts spermaceti, and 5 parts vaseline, the other of 70 parts rubber and 30 parts unbleached beeswax, were found to yield the best results. The rubber should be new and pure and be melted at a low temperature in a covered vessel and the wax added and the mixture thoroughly stirred. The lubricant is unsaponifiable, but may be removed from the apparatus by nitric acid.

On a New Form of Water Blast. By B. B. Boltwood. *Am. Chem. J.*, **20**, 577–580.—The apparatus cannot be well understood without the diagram; the orifice offered for the entrance of air and water is of such size that any appreciable friction is avoided and the energy of the jet is transmitted to a much greater volume of water than in the Richards or Muencke apparatus. These latter forms furnish only 1.1 times the quantity of air for water used; this apparatus gives three times the volume of air for water employed.

TECHNICAL CHEMISTRY.

G. W. Rolfe, Reviewer.

The Clarification of Cane Juice with Lime, Sulphur, and Heat. By R. E. Blouin. *La. Planter and Sugar Mfr.*, **20**, 375–379.—An important paper on clarification of cane juice. The author's conclusions which favor preliminary sulphuring of the cold juice, liming to neutrality, and subsequent heating as the most effective means of clarification, are borne out by the elaborate analytical data presented.

The Use of Lime and Sulphur in Sugar House Work. By E. W. Deming. *La. Planter and Sugar Mfr.*, **20**, 379–381.—This paper contains many useful hints and notes on the application of these clarifying agents in factory practice.

Double Sulphuration and Filtration. By A. L. Bartholemy. *La. Planter and Sugar Mfr.*, **21**, 28–29.—The author discusses the merits of the system.

Centrifugal Defecation and Carbonatation. *Sugar Beet*, **19**, 79–80. This article describes the Hignette method of cold defecation of beet-juice with lime and separation of the precipitate from carbonatation by centrifugals. The advantages claimed are decrease of bulk of scums and consequent saving of sugar, amounting to 20 cents a ton.

BIOLOGICAL CHEMISTRY.

A. G. Woodman, Reviewer.

Analysis of the Rhizome of Aralia Californica. By William R. Monroe. *Am. J. Pharm.*, **70**, 489–492.—The author has made a study of the rhizome in a fresh condition and has separated a volatile oil having a strong aromatic odor. Besides minute quantities of sugars and proteid matter he found considerable amounts of calcium oxalate.

The Chemical Life History of Lucern. By JOHN A. WIDTSOE AND JOHN STEWART. *Utah Agr. Expt. Sta. Bull.*, **58**, 1–90.—This bulletin contains the results of a study of the chemical composition of lucern at different periods of its growth. The method of analysis has been mainly that of Dragendorff, the various extracts obtained having been subjected to a detailed examination. Experiments have also been made on the digestibility of lucern by methods of natural digestion.

Condensing Milk by Cold Process. By BYRON F. MCINTYRE. *Sci. Am. Supp.*, **56**, 18976–18977.—In condensing milk by cold process it is found necessary to have milk free from animal odor, because any odor is intensified by the condensation. The flavor is therefore corrected if necessary by heating the milk to 80° F. in a vacuum pan. It is then run through a separator set for "heavy cream" (assaying not less than 50 per cent. fat). The fat-free milk is cooled and then placed in freezing closets for twenty-four hours, the ice being removed at intervals by the centrifugal machine. 100 gallons of milk are condensed to 13 gallons, then $5\frac{1}{2}$ gallons of the heavy cream are added, so that if the final product is diluted with three times its volume of water it will contain an average of 3.6 per cent. of fat. The condensed milk has a sp. gr. of about 1.16; it has a smooth consistency, and a pronounced sweet taste. In keeping qualities it is superior to whole milk.

The Amount of Formaldehyde Gas Yielded by Different Lamps and Generators. By E. A. DE SCHWEINITZ. *J. Am. Pub. Health Assoc.*, **23**, 118–120.—The author finds that the various generators which he has examined do not furnish the theoretical or guaranteed amount of gas, the amount obtained varying from $2\frac{1}{2}$ per cent. to 20 per cent. of the guaranteed yield. The method found most satisfactory for the determination of the formaldehyde was the one depending upon the decomposition of hydroxylamine hydrochloride by formaldehyde gas. The formaldehyde acts upon the hydroxylamine hydrochloride so that hydrochloric acid is quantitatively replaced, according to the following formula: $NH_2O + HCl + HCHO = CH_2{>}N{-}OH + HCl + H_2O$. The hydrochloric acid set free was determined by titration with tenth-normal alkali.

Report of the Committee on Disinfectants. By FRANKLIN C. ROBINSON. *J. Am. Pub. Health Assoc.*, **23**, 101–109.—This preliminary report contains a description of the modes of preparation, and of the chemical properties of formaldehyde, together with suggestions as to its use for disinfection.

On the Determination of Undigested Fat and Casein in Infant Feces. By HERMAN POOLE. *J. Am. Chem. Soc.*, **20**, 765–769.—This paper is a continuation of one already published (*this Rev.*, **4**, 115). Results are given of a study of three cases in which the children were fed on a milk prepared from the average milk of a large number of cows, care being taken to have the milk, as nearly as possible, of the same composition.

The Fertilizing Value of Street Sweepings. By ERVIN E. EWELL. *U. S. Dept. Agr., Div. Chem., Bull.* **55**, 1–19.—This bulletin gives data concerning the disposition of street sweepings and a table of analyses.

The Chemistry of the Corn Kernel. By C. G. HOPKINS. *Univ. Ill. Agr. Expt. Sta. Bull.*, **53**, 180a–180d.—This bulletin is an abstract of the work done at the Station in analyzing the constituents of the corn kernel in order to determine their exact composition.

Foods and Food Adulterants. By H. W. WILEY AND OTHERS. *U. S. Dept. Agr., Div. Chem., Bull.* **13**, 1169–1374.—This portion of the bulletin is devoted to cereals and cereal products. It contains brief descriptions of the processes of milling and tables of analyses showing the composition of a great variety of cereals and cereal products, as bread, rolls, cake, etc. In most cases the calories of combustion have been calculated for the cereals, while in a few cases the heat of combustion has been determined by direct experiment.

G. W. ROLFE, REVIEWER.

Sugar Beets. By M. B. HARDIN. *S. C. Agr. Expt. Sta. Bull.*, **34**, 3–9.

Sugar Beets in Idaho. By CHAS. W. MCCURDY. *Univ. of Idaho Agr. Expt. Sta. Bull.*, **12**, 37, 73.

New Mexico Sugar Beets, 1897. By ARTHUR GOSS. *New Mexico Coll. Agr. Expt. Sta. Bull.*, **26**, 71–113.

Sugar Beets in Colorado in 1897. By W. W. COOKE AND W. P. HEADDEN. *State Agr. Coll. Expt. Sta. Bull.*, **42**, 3–64.

Sugar Beet Investigations in 1897. By A. D. SELBY AND L. M. BLOOMFIELD. *Ohio Agr. Expt. Sta. Bull.*, **90**, 123–162.

Wyoming Sugar Beets. By E. E. SLOSSON. *Univ. Wy. Agr. Coll. Bull.*, **36**, 189–205.—These bulletins are typical of the class which are being issued by the Agricultural Experiment Stations throughout the country. They contain many interesting

analytical data in various lines of research besides being popular manuals of beet culture.

A Soil Study. Part I. The Crop Grown: Sugar-Beets. By W. P. HEADDEN. *Col. State Agr. Coll. Bull.*, 46, 3–63.—This treats of an investigation of the effect of certain mineral salts, particularly alkalies, on the growth of sugar-beets. A great number of valuable data are presented. The conclusions arrived at are too many to be detailed here. In general, they show that in amounts even as small as a few hundredths of a per cent. in the soil, alkalies have a strong toxic action on the growing plant. Even extremely small quantities of alkali increase the ash of the beet notably. Much light is thrown, by these experiments, on the distribution of mineral matter through the tissues of the plant and the conditions of its assimilation.

Laboratory Notes. By F. H. STORER. *Bussey Inst. Harvard Univ. Bull.*, 2, 409–421.—In the main these notes describe a continuation of researches on the carbohydrates of tree trunks, dealing principally with the pentosan group. (A) With the idea that hemicellulose (xylan) is difficultly digestible and generally more stable than the other carbohydrates the author has examined decaying birchwood, but finds much less gum than in sound timber. (B) The details are given of an elaborate investigation of the carbohydrates and derived products. (C) The solvent action of alkaline solutions on the xylan of coniferous wood under various conditions, and its bearing on the accuracy of the results of analyses are treated at length. (D) The amount of wood gum in the strawberry is shown to be small. (E) The possible presence of xylan in the membrane of the starch grain in the light of experimental evidence collected is discussed. (F) An analysis is given of the ashes of Javan sugar-baskets, disposed of at the refineries by burning, which shows that they are inferior to wood ashes for fertilizer.

Notes on Taka-Diastase. By W. E. STONE AND H. E. WRIGHT. *J. Am. Chem. Soc.*, 21, 639–647.—A comparative investigation of the hydrolyzing action of malt- and taka-diastase infusions on potato starch paste. Taka-diastase evidently acts more energetically than malt-diastase up to a certain point, but does not, under the hydrolyzing conditions used by the author, carry the conversion nearly as far. In starch determinations, the use of taka-diastase was found objectionable, owing to incompleteness of its solvent action. The reviewer suggests that much might be learned by an investigation of the carbohydrates formed under varying conditions of hydrolysis by methods similar to those used by Brown and Morris on malt-diastase conversions. It

would certainly be interesting to compare the curve of copper reduction with that of malt-diastase hydrolyzed products.

METALLURGICAL CHEMISTRY.

H. O. HOFMAN, REVIEWER.

Improvements in Mining and Metallurgical Apparatus during the Last Decade. By E. G. SPILSBURY. *Trans. Am. Inst. Min. Eng.*, **27**, 452–465.—A presidential address.

Silver-Lead Blast Furnace Construction. By H. V. CROLL. *Eng. Min. J.*, **65**, 639–640.—The paper is an illustrated description of some of the leading improvements that have been made during the last ten years in the constructive details of lead blast furnaces, especially in Colorado and Utah.

Recent Advances in Silver-Lead Smelting. By R. H. TERHUNE. *Min. Sci. Press*, **77**, 132–133.—The paper represents an address delivered by the author last July, at Salt Lake City, before the International Mining Congress, and is therefore rather general in character. The work of the Ropp Straight-Line Mechanical Roasting Furnace, which the author introduced at the Hanauer Works in 1896, is given in more detail than any other subject discussed.

The Condition in which Zinc Exists in Lead. By M. W. ILES. *School Mines Quart.*, **19**, 197–200.—Zinc can be present in a lead blast furnace slag as oxide, silicate, and sulphide. Of these the oxide is readily soluble in dilute sulphuric acid, the silicate less so, the sulphide not at all. The author treated finely pulverized slag with sulphuric acid of different degrees of concentration, for 25 hours, and found that part of the zinc only went into solution, and then very slowly. He concludes from this that zinc is present chiefly in the form of silicate. He proved that some zinc is present as sulphide by blowing compressed air through molten slag and analyzing the fumes which had been caught by sucking the gases through muslin and woollen filters. The analyses showed the presence of lead, zinc, silver, traces of gold and copper, and of sulphur and sulphur trioxide.

The Distribution of Precious Metals and Impurities in Copper and Suggestions for a Rational Method of Sampling. By E. KELLER. *Trans. Am. Inst. Min. Eng.*, **27**, 106–123.—This paper has been previously published (*J. Am. Chem. Soc.*, **19**, 243–258) and reviewed (*this Rev.*, **3**, 98–99).

The Jeffrey Double-Strand Scraper Conveyor. By R. P. Rothwell. *Eng. Min. J.*, **66**, 341.—A short illustrated description of a conveyor intended for the charging of ore into leaching vats. With the large capacities of the vats used in cyaniding low-grade gold ores, the introduction of mechanical devices for charging is becoming of increasing importance.

The Potsdam Gold Ores of the Black Hills. By F. C. Smith. *Trans. Am. Inst. Min. Eng.*, **27**, 404–428.—The main part of this paper discusses the occurrence and the general character of the siliceous silver-bearing gold ores near Deadwood, S.D. It gives also a brief outline of the three processes by means of which they are treated; *viz.*, barrel chlorination (Golden Reward Co., 39,000 tons; Kildonan Milling Co., 36,000 tons), cyaniding (Black Hills Gold and Extraction Co., 6,500 tons), and smelting with pyrite and copper ore for matte (Deadwood and Delaware Smelting Co., 65,700 tons). There are shipped outside 4,800 tons, making a total annual product of 152,000 tons.

Note on the Influence of Temperature in Gold Amalgamation. By F. F. Sharpless. *Eng. Min. J.*, **66**, 183.—The author, contributing to the discussion given in the title, found that with increase of temperature of battery-water, the amalgam became harder until with the water at 83° F., quicksilver ran off from the lower plates into the trap, which forced him to hang up the stamps. He was using old plates, and from the upper parts the silver had all been worn off. These worked well with warm water, while the lower parts, which were still well silvered, would not retain even the quicksilver that rolled off from upper parts.

Testing Oxidized and Pyritic Gold Ores. By P. H. van Diest. *Min. Sci. Press*, **76**, 568.—The paper embodies practical hints for the amalgamator and contains a few remarks about chlorinating and cyaniding.

The Chlorination Mill at Colorado City. By H. V. Croll. *Eng. Min. J.*, **66**, 425–426.—The paper is an illustrated description of a barrel-chlorination plant intended to treat Cripple Creek gold ores. Special attention appears to have been given to the cheap handling of ores. There is a large ore-bedding floor, having a capacity of 7,000 tons. The ore is dried and roasted in mechanical furnaces. The mill has 10 barrels, 6′ in diameter and 12′ long, receiving each a charge of 9 tons of ore, which is chlorinated in from 1 to 3 hours. The barrels have coarse sand filters inclosed in finely perforated sheet lead. These are to retain the larger part of the pulp; the fine slimes passing through them are removed by filter boxes placed in a separate building.

Cyanide and Chlorination in Colorado. By R. B. Turner. *Rep. State Bureau Mines, 1897*, 127–132.—The paper discusses the economic rather than the chemical features of the two processes as carried out to-day in Colorado. Thus the cost of cyaniding in a 50-ton plant is given as $2.70 per ton of raw ore, to which $0.75 may have to be added for roasting and $0.45 for sampling.

The Cyanide Process. By S. B. Christy. *Trans. Am. Inst. Min. Eng.*, **27**, 821–846.—A discussion by E. B. Wilson, A. James, and G. A. Packard.

Analyses of Cyanide Mill Solutions. By W. J. Sharwood. *Eng. Min. J.*, **66**, 216.—The changes mill solutions undergo are shown by nine complete analyses made by the author. The table gives also the tons of solutions from which the samples were taken, the time they were in use, the general character, size, and tons of ore treated by the solutions. The accompanying text discusses in detail the character of the ores, the manner of working in the mills, and the methods followed in analyzing.

The Precipitation of Gold by Zinc Thread from Dilute and Foul Cyanide Solutions. By A. James. *Trans. Am. Inst. Min. Eng.*, **27**, 278–283.—The precipitation of gold from very dilute solutions is found to be defective in some cases; in others the gold from solutions with less than 0.05 per cent. free cyanide is reduced to below one grain per ton. The author found that the imperfect precipitation is sometimes caused by the shavings being too coarse and not packed tightly enough in the precipitation bases, which often are too shallow. Their depth ought to be greater than either the width or the length. Further, by giving the solutions a longer contact with the zinc and by making them slightly alkaline with caustic soda, they are easily freed from their gold; thus, a flow at the rate of 1 ton solution per 24 hours for each cubic foot of zinc shavings and an addition of one-half pound of caustic soda per ton of solution are usually sufficient. With very foul solutions, containing no free cyanide, a flow of one-half ton solution per cubic foot of shavings in 24 hours, will remove the gold. Solutions containing 0.2 per cent. copper were effectively treated as long as the flow was slow enough and the acidity had been neutralized with caustic soda.

The Influence of Lead on Rolled and Drawn Brass. By E. S. Sperry. *Trans. Am. Inst. Min. Eng.*, **27**, 485–505.—The author examined systematically the influences varying percentages of lead have on a brass composed of sixty per cent. copper and forty per cent. zinc, keeping the copper constant and

replacing parts of the zinc by lead. Cuttings from such a brass free from lead are long and tenacious, so that a very low speed must be employed in cutting; when, however, two per cent. lead are added (leaded brass), the chips are very short and a high speed can be employed in cutting. Clock-brass and screw, or drill-rod brass, are common varieties of leaded brass.

The Influence of Lead on Rolled and Drawn Brass. By F. FIRMSTONE. *Trans. Am. Inst. Min. Eng.*, 27, 977–978.—The author discusses the subject treated in the article abstracted in the preceding review, and brings out the fact that as early as 1818 Berthier had called attention to the effect of lead on brass.

A Combination Retort and Reverberatory Furnace. By COURTNEY DEKALB. *Trans. Am. Inst. Min. Eng.*, 27, 430–436.—The paper is an illustrated description of a reverberatory furnace with a single zinc-retort, 9½x36 inches outside dimensions. It is the one used in the metallurgical laboratory of the Rolla School of Mines for the reduction of roasted zinc ores.

Zinc Smelting in the Joplin District. By E. HEDBURG. *Mines and Minerals*, 19, 103–104.—The main value of this paper lies in the figures of cost that it gives of the smelting of blende in Southwestern Missouri. It enumerates the leading zinc works in the Central Western States, gives an outline of roasting in a 2-hearth hand reverberatory furnace, and of reducing in a double direct-fired Belgian furnace, with 56 retorts, (7′ long, and 8″ in diameter) on a side. The cost is given in full for a plant having six double retort-furnaces, or 682 retorts in all. For details the reader is referred to the original.

Notes on Six Months' Working of Dover Furnace, Canal Dover, Ohio. By A. K. REESE. *Trans. Am. Inst. Min. Eng.*, 27, 477–485.—The iron blast furnace, the work of which is described in the paper, was built in 1895. It is 75′ high, the crucible 10′6″ in diameter, and 5′6″ deep, the bosh 16′6″ and the stock line 12′6″ in diameter. It has a Y-shaped downcomer, taking the gases from two openings in the furnace. For details the reader is referred to the original.

The Recovery of Iron from Cupola Cinder. By W. J. KEEP. *Iron Age*, 61, 6.—In iron foundries there is a considerable loss of metal in the form of small shots in cinders and skulls. Thus, every ton of dirt that goes from the common cinder mill to the dump contains about 300 pounds of shot, and the skulls from 100 ladles about 75 pounds iron. In order to recover this waste, the author uses a horizontal wet-crushing revolving cylinder,

30″ in diameter and 40″ long on the inside, having a longitudinal, star-shaped iron roller which breaks up the cinder while the barrel revolves. The finely-crushed cinder, coke, dirt, etc., are carried out automatically, leaving behind the clean shots of metal.

Sulphur in Embreville Pig Iron. By G. R. Johnson. *Trans. Am. Inst. Min. Eng.*, **27**, 243–249.—The author investigated the distribution of sulphur in Embreville (Tenn.) pig iron. He obtained fractions from 43 pigs and took 9 samples from each fracture and analyzed them separately for sulphur. In addition, he determined from the average of each set of nine samples the sulphur, silicon, and phosphorus. The results show that the top of a pig is always richer in sulphur than the bottom. The author attributes this fact to the pig's giving off, during solidification, included gases, particularly sulphur dioxide, which cannot escape completely. He believes also that the rough surfaces especially of pig irons low in silicon are due to the escape of sulphur dioxide rather than to a small percentage of silicon.

The Micro Structure of Steel and the Current Theories of Hardening. By A. Sauveur. *Trans. Am. Inst. Min. Eng.*, **27**, 846–944.—A discussion by A. Ledebur, R. A. Hadfield, H. C. Jenkins, J. O. Arnold, H. D. Hibbard, P. H. Dudley, E. D. Campbell, F. Osmond, H. M. Howe, and the author.

The Calorific Value of Certain Coals as Determined by the Mahler Bomb. By N. W. Lord and F. Haas. *Trans. Am. Inst. Min. Eng.*, **27**, 259–271.—The principal aim of the paper is to determine the calorific powers of a number of coals in general use in Ohio and to find out whether analytical data can be safely used for their values. For this purpose forty samples of coal, each weighing 50 pounds, were obtained; *viz.*, 11 samples from Upper Freeport coal (O. and Pa.), 7 from Pittsburg coal, 11 from Middle Cittanning (7 Darlington coal, Pa., and 4 Hocking Valley coal, O.), 4 from Thacker coal (W. Va.), 5 from Pocahontas coal (Va.), and 1 from Mahoning coal (O.). Ultimate and proximate analyses were made of each. The calorific powers were determined with the Mahler bomb and calculated from the Dulong formula including the values for sulphur. The tables of results give also: The differences between the determinations and the calculations of the calorific powers; the average analyses and heating powers of the single seams; and the heating power of each sample calculated from the average heating power of the seam to which it belongs. The results

show that for the coals examined the values calculated from the ultimate analyses agree within 2 per cent. with those obtained with the Mahler bomb. They also prove that the method suggested by Kent (*The Mineral Industry*, 1, 97) of calculating the calorific power from the fixed carbon obtained in the proximate analysis does not give satisfactory results. Finally, by comparing the calorific powers of the different samples from a single seam with an average of all the calorimetric tests, ash and moisture being excluded, results are obtained which show that the actual coal of a given seam, at least over considerable areas, has a uniform heating value.

The Calorific Value of Certain Coals as Determined by the Mahler Bomb. By W. Kent. *Trans. Am. Inst. Min. Eng.*, 27, 946–961.—This is a discussion of the preceding paper.

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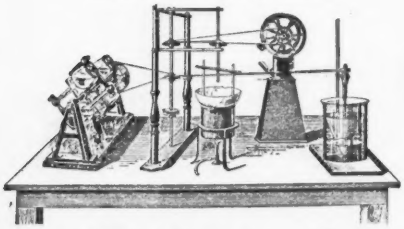

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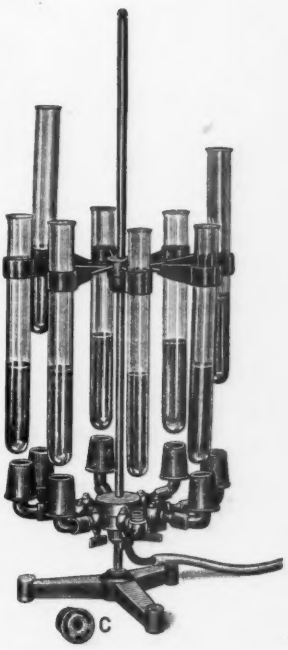

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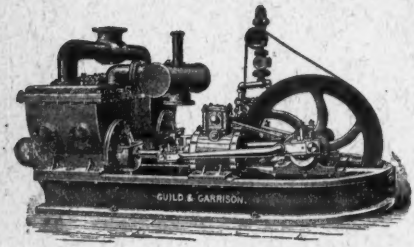

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